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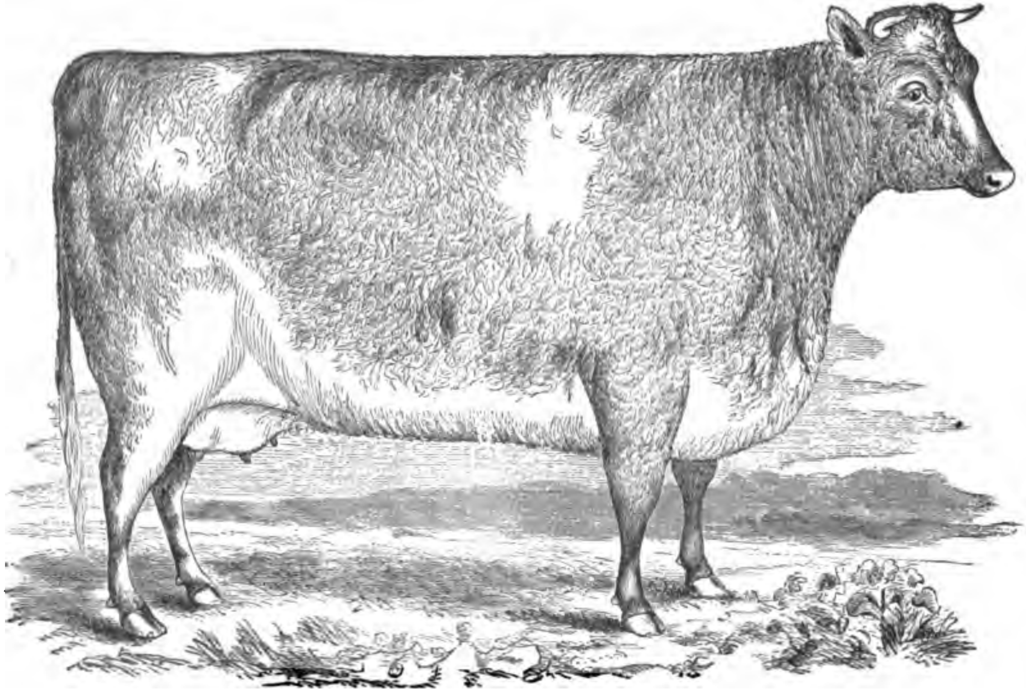

CRYSTAL MAID, a thorough-bred Short-Horn Cow, 2 years old.

SECOND ANNUAL REPORT

FROM THE

STATE BUREAU OF

S

Compliments of
THE AUTHOR.

FOR GENERAL DISTRIBUTION.

FRANKFORT, KY.:
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FRANKFORT, KY., January 1, 1879.

To His Excellency, JAMES B. McCREARY, *Governor of Kentucky:*

SIR: The third and sixth sections of the law establishing the Bureau of Agriculture, Horticulture, and Statistics require the Commissioner to make out and compile an Annual Report, giving a general review of the agricultural and other industrial resources of the State, and such other information and statistics as he may deem of advantage and interest to the citizens of the Commonwealth. In accordance with this requirement, I have compiled the following Report, and submit the same for publication and general distribution. In this volume will be found much useful information, carefully collected, which, I trust, will be of great advantage to the various industries of our State.

I am, very respectfully,

W. J. DAVIE, *Commissioner.*

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GEOLOGY AND TOPOGRAPHY OF KENTUCKY.

Kentucky spreads over that portion of the great Mississippi Valley situated between latitude 36° 30′ and 39° north, and longitude 5° and 12° 38′ west from Washington City, D. C. Its area is about 40,000 square miles. On its west and northwest border it extends along the banks of the Ohio river from the mouth of Big Sandy, by which the State is separated from West Virginia, about six hundred and fifty miles to its junction with the Mississippi river. It extends along the east bank of the Mississippi about fifty miles to the north border of the State of Tennessee; thence, by an arbitrary line, running east or nearly east (except a northern backset where the line passes along the Tennessee river), it borders on the State of Tennessee until the line reaches the southwest corner of the State of Virginia on the top ridge of the Cumberland or Allegheny Mountains; thence an arbitrary line, along the ridge running northeast, separates Kentucky from the State of Virginia, until it reaches the main fork of Big Sandy or Chatterawah river, which, from this point, running in a northwest direction to its mouth in the Ohio river, is the boundary between West Virginia and the Commonwealth of Kentucky.

Within and bordering on this large extent of territory are several noted rivers that afford thousands of miles of navigable waters, and a sufficiency of water-power adapted to running machinery, were the same utilized, to place this State in the front rank among the manufacturing and commercial countries of the world. These streams are the Mississippi, Ohio, Tennessee, Cumberland, Green, Kentucky, Licking, Big Sandy, Tug, Big and Little Barren, North, South, and Middle Forks of Kentucky, Rockcastle, South Fork of Cumberland, West Fork of Big Sandy, Poor Fork of Cumberland, Rough, Little River, and numerous other rivers and creeks scattered over every part of the State.

The Appalachian or Allegheny range of mountains, located along the entire eastern border of the State, seems at some former geological period to have been uplifted by a slow, gradual process, in such manner as to give a northwestern or western declination to the entire area of the country from the summit of the Cumberland Mountains to the Ohio and Mississippi rivers.

Thus we find the entire eastern slope of the great Ohio and Mississippi Valleys lying between 36° 30′ and 39° 06′ to be embraced within the territory of this Commonwealth.

Rock and Mineral Formations.—The general geological formations have been so fully and skillfully enumerated in the two excellent surveys made by the late Dr. David Dale Owen and by Prof. N. S. Shaler, that it would be a work of supererogation in me to attempt to recapitulate what they have so plainly and scholastically given to the world in their invaluable series of reports I will, however, state that in Kentucky there are no *true veins of any of the precious metals*, and probably no metalliferous deposits of any kind to be found on the surface, except those of aqueous origin. In all mountainous granitic countries, where the Plutonic or igneous rocks come to the surface, are generally found true veins (cast up by the action of the internal fires of the earth) of different kinds of metals, such as gold, silver, platinum, copper, quicksilver, tin, &c., in addition to the more common minerals—iron, zinc, lead, sulphur, &c. The entire surface of the country in Kentucky was formed by deposits of such minerals as go to make up our rocks, metals, and soils, under oceans of water, in a far distant geological era or period, probably before any of the existing mountains on the globe were upheaved. The generally horizontal position of our stratified rocks show that they were laid down upon a plain surface, upon the floors of seas and oceans, teeming with animal life of a low order, such as sea worms, corals, and shell-fish. There have been no great or sudden volcanic upheavals, such as are to be found along the range of the Rocky Mountains, the Cordilleras, or Andes. There are no Plutonic, igneous, or granitic rocks in their true position to be found in the State. The lowest surface formation in the State is the stratified rocks of the Cambrian era, answering to the base of the Trenton period or the Caradoc beds of the British Isles. We are told, however, by Prof. Cox, of the Indiana Geological Survey, that there are some places along the Ohio river where the older rocks have been lodged, during the drift period, upon the Kentucky shore, at some places for quite a distance in the interior. Our Geological Reports, however, have made no mention of such deposits. The Cambrian rocks come to the surface about twenty miles above Cincinnati on the Ohio river. These rocks are based upon the calciferous sandstone formation, in which is located one of the two great *water reservoirs* in our State, from which probably originate all sulphur and mineral springs that are to be found in the blue limestone formations in Kentucky, such as the Blue Lick, Big

Bone Lick, &c., &c. Immediately above the Trenton Group, or Cambrian, comes the stratified Silurian rocks, which, together with the Cambrian, usually are about 500 feet thick. The top or Upper Silurian rocks of this formation, usually about 100 feet thick, contain frequently quite an amount of what is known as Clinton iron ore. In the Silurian formation are to be found lead ores and barytum in pockets, or mingled promiscuously when settling under water, and probably while in a dissolved state, with the limestone rocks. In like manner, iron ores are found in many localities so mixed with the clays in some sections as to form first-class "paint earth," but nowhere as yet found in quantity sufficient for profitable furnace working. The Cambrian and Silurian formations embrace all of that portion of the State known as the "Blue Grass Region" proper, and extend over about 9,000 square miles.

Next above the Silurian overlie the Devonian stratified rocks (sandstone and limestone) intermixed with black and grey shale, and characterized by a dense clay soil. In this formation is found the rich lubricating oils that doubtless exist in greater or less quantity throughout this formation, which passes around the entire Silurian formation, in a bed containing less than 600 square miles. Salt wells and mineral springs have their origin in this, the second water reservoir of the State.

Next above the Devonian lie the Waverley series of rocks (mostly sandstone), usually about 500 feet thick. This formation extends over about 5,000 square miles, and encircles the Devonian like that formation does the Silurian.

Next above in this geological formation come the Subcarboniferous strata of cavernous limestone, which embrace a larger proportion of the State than any, except the Carboniferous or coal-bearing series, since the Tertiary formations west of the Tennessee river are located on this series of rocks. Probably nearly 11,000 square miles of the State are based on this formation.

Above the Subcarboniferous lies the Carboniferous formation, composed of several groups of stratified rocks (sandstone and limestone) interstratified with beds of coal, iron, and other minerals. In this formation, which occupies about 14,000 square miles in the State, are to be found endless varieties of mineral waters, iron ores, coal strata, pottery clays, through a distance of from 800 to 2,500 feet.

Iron ores, fluor-spar, lead, zinc, barytum, and other base metals, are to be found in every geological formation in the State in greater or less quantities, but notably rich in the Devonian, Subcarboniferous, and Carboniferous series. All of these metallic substances were originally, or rather formerly, held in solution in the waters of the primitive oceans or seas which overspread the areas of Kentucky, which were in many places of great depth. These waters may at times have been tepid, or, at least, much warmer than the ocean is at present, so that precipitation of mineral particles would take place more rapidly than they now do in the great bodies of water on our globe. The laws of attraction and cohesion would naturally draw together such materials as had an affinity, and owing to the easy mobility of liquids, would cause them to collect in seams, pockets, and special localities, to be there left in the quiet eddies of the ocean currents. In this manner, no doubt, were deposited, *by precipitation*, all the rocks and metals now located in the different strata. These strata were laid at the bottom of the oceans horizontally, but have assumed their present position from the natural results of upheavals and depressions which were slowly and gradually alternating throughout the entire surface of the earth for countless ages during the different geological periods.

Formation of Soils.—All our soils are made up of rocks which have been worn down or decomposed. There are two great fundamental principles by which this decomposition of rocks is effected—the first is *chemical action or affinity*, and the second is *attrition or grinding.*

In reference to their formation, all soils may be placed under five leading and notable heads or classes. The origin or composition of each is indicated by the names which geologists have sometimes given to these classes:

I. Granitic or gravelly soils, of granite origin.
II. Schistose soils, of schistose or slaty origin.
III. Calcareous soils, of limestone origin.
IV. Loamy soils, of clay and sand origin.
V. Mould, of vegetable origin.

It is rarely, if ever, we find any one of these classes perfectly pure and isolated; but it is generally more or less mixed with one or more of the others.

CLASS I.

Gravelly Soils are essentially composed of the same elements as granite, which are sand, clay, and potash in quantity, and small proportions of magnesia, lime, and iron. The most valuable of these elements for plant food is potash, which is held in an insoluble state in granite. Unless this element can be unloosed by some chemical action, so as to become *soluble*, the gravelly soil will be incapable of growing to perfection most kinds of vegetables or plants.

Here comes in the chemical principle of *affinity*, of which I have before spoken, to aid the soils, and make the desired change. Let me here digress for a short space.

There is in nature an all-pervading gaseous element known to the chemists as oxygen. This is the basis of acids. Its duty seems to be that of the great form-changer or decomposer of the materials of our globe. It unites by chemical affinity readily with almost all other substances, but much more readily with some than others. It forms between one fourth and one fifth part of the atmospheric air, and is a component part of nearly all compound bodies. When two parts of this oxygen combine with one part of carbon it forms an acid exceedingly corrosive in its nature, known as carbonic acid, though later chemists call it "carbon di-oxide." This acid in a gaseous form is familiar to us as exhibited in the impure air which all red-blooded animals expire from their lungs; in the bubbles of soda water; in the damps of wells; and in the pure bubbling, sprightly taste of fresh spring water. In all marbles and limestones it exists as a base, being 44 per cent of their material in a solid form. This carbonic acid is one of the most, probably the most, active agent in nature. Its affinitizing properties are so great, and its all-pervading presence so universal, that nothing can escape its action. It is the principal agent in decomposing granite and all other rocks. It readily dissolves or combines with water, and in this soluble condition unites with the element of potash in granite, and sets it free from the sand, clay, and other matter with which it is connected. In like manner it combines with the different elements in all other rocks, and liberates them, forming what is known by chemists as carbonates or bicarbonates of these materials, as, for instance, bicarbonates of potash, soda, magnesia, lime, &c., &c.

All these compounds are easily soluble in water. The carbonic acid has but little affinity for sand and clay, and, therefore, it sets them free by combining with the other elements. But the bicarbonates which have been formed by the action of the carbonic acid are leached through the sands and clay, and are held by them, stored ready for use as plant-food, when required by the vegetables or plants which may come in contact through their rootlets with them. Much of these compounds are, of course, washed off through the creeks and rivers into the ocean, and keep up the supply of salts and minerals there. It frequently happens, also, that these salts, by exposure to the air, lose one part of their carbonic acid, as, for instance, the bicarbonate of lime may lose one part of its carbonic acid, when it becomes the carbonate of lime, then it at once is precipitated to the bottom of the stream or ocean in the form of a fine white powder, and is, in process of time, solidified into limestone or marble. Iron and other minerals in the same manner are precipitated in the beds of streams, lakes, or oceans, and form beds or strata of iron ores, &c., &c.

This same corroding or gnawing influence of carbonic acid is going on every day on all our farms, dissolving into finer particles the coarser grains of matter, so that they may become more easily soluble through the action of the air and rains; and the entire object of the farmer, in cultivating the soil, besides killing off grass and weeds, *is to expose the particles of earthy matter to the all-pervading action of carbonic acid, through which it may be rendered soluble, and fit to be assimilated by the plants as food.*

What I have here said, regarding the action of carbonic acid on granite and granitic soils, will apply with equal force to all other rocks, and every other kind of soil. There is none of this class of soils (the granitic) in Kentucky, although there may yet be discovered traces of such, resulting from the ice drifts that, in former geological eras, brought the larger part of the present top soil, covering the greater area of the neighboring States of Ohio, Indiana, and Illinois, from the vast plains and mountain regions north and northwest of the great lakes (possibly from as far north as the 80° to 85° of north latitude), and depositing the drift, formed from crystalline rocks, in immense quantities, varying from a few feet to several hundred feet, over the surface of the country.

CLASS II.

Schistose or Slaty Soils are formed from the *débris* of slaty rocks. These contain the elements which constitute good soil. The dense clay soil of our Devonian series are of this class. These clays are apt to hold water, and require under-tile drainage, in order to bring into action the full capacity of the lands There is in Kentucky probably from 500 to 600 square miles of this quality of land. Here, as in Class I, carbonic acid is the great disintegrater of the slaty rocks, and the active working agent in reducing them into useful soils. The expansion caused by heat and moisture, and the contraction caused by cold and drought, together with the attrition or grinding process, which is put into action through all these agencies, each has done its part in reducing the rocks of this class into fine soluble particles, just as in all the other classes. This class of lands excels for orchards and vineyards, and if properly fertilized with superphosphates and potash and nitrogen, produces the best of all kinds of fruits, berries, and garden vegetables, as well as the general staple crops of the country.

CLASS III.

Calcareous Soils are formed from the ruins of limestone rocks, marbles, and carbonates of lime in shells or other forms. The limestones or carbonate of lime contain forty-four per cent. of carbonic acid, but this is locked up in a condition not easily soluble. In order to change this, if water, having an excess of carbonic acid, can be brought in contact with the carbonate, it at once imparts to the carbonate another quantity of carbonic acid, thus forming a bicarbonate of lime, which is readily soluble, and when in the soluble condition becomes one of the most general and useful articles of plant food. A very large majority of the soils of Kentucky is of this class, which accounts for their general fertility. The "Blue Grass Region" proper is of this class; so are the Lithostrotian or cavernous limestone lands of South Kentucky and Northern and Central Tennessee. This is the "best wearing and most lasting" of all lands, from the fact that the continual disintegration of the rocks is every day adding new stores of plant food to the soil, which are mingled with the clay and silex, by means of sipeage, leaching, capillary attraction, and cultivation. Besides the Silurian and Subcarboniferous or cavernous limestone formation, a very large proportion of the Carboniferous or coal-bearing formation in the State possesses soils belonging to *Class III;* so that we may safely say that there are over 30,000 square miles of calcareous soil in Kentucky. This class in Kentucky, however, is not anywhere purely calcareous, but is everywhere more or less mixed with other classes, while its main features are calcareous. No other class of soil can be so easily fertilized, nor retain the manure so intimately, as these calcareous soils and their accompanying clays.

CLASS IV.

Loamy Soils, formed of sand and clay, are seldom found pure. If they were in this state they would be useless for cropping purposes, as clay enters very slightly into any crop, and sand is, as every one knows, perfectly sterile. In Kentucky we have a large amount of this class of soil liberally mixed with the elements of plant food from other classes, particularly from Class II and Class III. We find this the case generally in the Waverly series, which cover nearly 5,000 square miles of the State. The more fully this class is mixed with other classes, the better is the productive qualities of the lands. In the Waverly series of our State we find much excellent land, while some of it is poor; this latter, however, forms but a small fraction of the whole. As a general rule, the Waverly or Subcarboniferous sandstone formation gives a soil of light clay loams, considerably intermixed with calcareous matter, which renders them well adapted for all kinds of fruit, and fair soils for grain and grasses. These lands are susceptible of great improvement by the use of chemical fertilizers, but do not retain them so tenaciously as Class III.

CLASS V.

Mould Soil is entirely of vegetable origin, and is formed by the falling and decay of all kinds of vegetation, and of course contains every element necessary for plant food in a concentrated and readily soluble condition. These elements have not only been drawn from the inorganic mineral substances of the earth, but also from the organic elements of the atmosphere. This class is the richest of all others, and is to be found scattered over the entire surface of our State in variable depths, and is by the process of cultivation easily mixed and incorporated, by mechanical appliances, with the soils of every other class, when it becomes in fact a first-rate fertilizer for every kind of cropping. The great richness of the underlying rocks in Kentucky has caused a most luxuriant growth of all kinds of indigenous plants that for thousands of years have fallen, decayed, and added to the vegetable mould of our top soil, until this class has become a distinguishing feature on all of our uplands, as well as river and creek bottoms.

Kentucky Purchase Lands.—In the extreme southwestern part of the State are seven counties—Calloway, Marshall, Graves, McCracken, Ballard, Hickman, and Fulton—which form an exception to the general conformation of the balance of the territory of the Commonwealth. Geologically, these lands are Quaternary, and were formed by drift or sediments from all the different rock formations of the upper or northern part of the Mississippi Valley, and possibly in part from the country north of the lakes. But these deposits were not glacial or made by the "ice drifts," as were the deposits in Ohio, Indiana, and Illinois. The indications are that there existed a great sea or ocean throughout the upper Mississippi Valley, connected with the great lake regions, while another great sea or ocean extended from the Gulf of Mexico to the northern and eastern banks of the Tennessee river, from the Muscle Shoals to its mouth, and thence across the lower end of the State of Illinois into Missouri. The dividing dry land ridge between these oceans seems to have extended from the Cumberland Mountains to the Ozark range in Missouri, and crossed the Ohio river at or near the "Grand Chain," near Paducah, and probably extended north as far as Tradewater river.

By some great action or wave force from the interior of the globe the earth gradually began to rise towards the north and subside towards the south, until the waters broke through the dry land barrier at "Grand Chain," and at a similar point on the Mississippi river some distance above Cairo, and emptied themselves into the sea south of the Tennessee river. In process of the Quaternary period this southern sea was filled with numerous washings of mud that were precipitated, and formed the strata representing every shade of soil northward, from Cairo to the farthest limits of the Mississippi river and its tributaries. Finally, a further upheaval of that portion of this ocean which occupied from the Gulf of Mexico to Cairo took place, and made its bed dry land, or also during the same geological period a lower depression of the bed of the Atlantic drew off the waters into their present location, and left this territory dry land. It is quite probable that a similar ocean once existed above the falls of the Ohio at Louisville, which was drained by a break through the coralline rocks at the falls, and through Muldraugh hills, which then extended across into Indiana. The sudden escarpment of the Lithostrotian limestone formation along the entire west bank of the Tennessee river shows conclusively that this decadence was precedent to the Quaternary period, when the lands of the Kentucky Purchase and West Tennessee were deposited.

The Kentucky Purchase lands are (many of them) very rich, containing the elements of plant-food, such as are found in each one of the five classes. They are also considerably varied and "spotted," being dependent for their richness upon the source whence came the special strata of soil or deposit, that have been left on the top of the earth when it became dry land. There are similar deposits of Quaternary soils along the banks of Green river in Daviess, McLean, and Muhlenburg counties, which may have been caused by similar local action.

The "Kentucky ridge," beginning on the head waters of the Kentucky river, and running northwest across the State, the "Muldraugh Hills" or ridge, the Green river ridge, and the Cumberland and Tennessee river ridges, all seem to have been dry land, and connecting links between the Cumberland Mountains and other ranges, or else were elevations which existed under water before the country was generally elevated above the ancient ocean.

The influence of these and other ridges in locating currents no doubt has been very great in giving peculiar excellencies or deficiencies to the soils in different localities in our State, and causing them to be more or less "spotted" in every section.

I have given this synoptical view of the topography, geology, and formation of the soils in Kentucky in order to induce our agriculturists to study more deeply into the science of land tillage, by having a practical knowledge of the elements of the soil which they may have to cultivate. Other articles in this report will illustrate the manner of fertilizing and preserving these lands, and how to make them profitable to the owners.

SUMMARY.

As a whole, the surface of Kentucky, though quite varied in its geological structure, includes a larger body of very fertile land, and a less amount of barren soils, than any other equal area on this continent, which is so rich in mineral wealth. In most other countries where there is an abundance of coal, iron, and other minerals, the bounty is marred by a corresponding sterility of soils; but here, even the mountain lands, where the shape of the surface admits of cultivation, are furnished by the Carboniferous rocks with a soil well filled with the elements of plant-food, and highly adapted to a varied range of crops and timber growth. The 30,000 square miles of limestone soils in the State are not excelled by any similar amount of farming lands in any country, while the Quaternary and other classes of soils are each most excellent of their kind, and all susceptible of a high state of fertilization, so as to preserve their productive qualities for all coming time.

In coal, iron ores, and other useful minerals, Kentucky is peculiarly blessed; having more coal and iron ores than Great Britain or France or Prussia, or any other country in Europe; while she heads the list of all the States in the American Union in these articles. She excels Pennsylvania and Ohio, Alabama, Tennessee, West Virginia, Virginia, and Missouri in the amount and varieties of iron ores, coals, and timber. Her resources being so great, and her navigable rivers so numerous, her climate so temperate, salubrious, and equitable, and the basis of her soils so rich, the proud old Commonwealth is certainly destined to be a leader in the future in the agricultural, mechanical, and manufacturing industries of the great Mississippi Valley.

PLANT-FOOD AND AGRICULTURE.

In several of the States of our Union there are "State Boards of Agriculture," which meet once a year, and discuss all kinds of subjects appertaining to agriculture, horticulture, stock-raising, forestry, &c., &c. One of the best appointed of these Boards is that of the State of Connecticut, presided over by the Governor of the State, *ex officio*, and managed by a joint board of officers appointed by the Governor and chosen by the different county agricultural societies in the State. At the regular yearly meeting essays are read and discussed, reports are made from the Agricultural Experiment Station, and other general business attended to. Such an adjunct to this Bureau would be of great benefit to the people of Kentucky. To illustrate the proceedings of these Board meetings, as well as to give an excellent essay by Dr. E. L. Sturtevant, one of the best agricultural writers and experimenters in the Union, and the discussion on the subject treated of in his essay, I will here copy several pages from the "Tenth Annual Report of the Secretary (Hon. T. S. Gold) of the Connecticut Board of Agriculture " The discussion is by Prof. W. O. Atwater, Chemist and Director of the Experiment Station, and others, all thinking and practical scientific agriculturists. In his essay Dr. Sturtevant says:

"The soil contains the food of plants. The plants assimilate this food, and combining it with supplies obtained from the air, through their vital forces, build up their structure which is to supply food for man. There is therefore a close relation between the soil and the plant, and between the plant and the man.

"We have a difference between the natural field and the agricultural field, and the difference is brought about through the relations of man. In the natural field there is no renewal of product by man, while in the agricultural field there is renewal. The natural field wastes little or none of the food elements, but rather accumulates; the natural crop containing but little plant-food compared to the artificial. The artificial field has to annually supply large quantities of its fertile elements to the plants for removal from the land. A ton of wood contains about three pounds of potash, the ton of barley fodder about eighteen pounds; the ton of leaves returns to the soil say four pounds of potash, the ton of growing wheat removes fifteen pounds. We may, therefore, cut woodland and yet grow woodland without fear of failure from deficient plant-food, for the growth of our wood contains but little ash element and but little nitrogen, and disintegration more than keeps apace with the wants of the trees. The cultivated crop, on the other hand, removes considerable ash element, and much nitrogen. In the one case the farmer removes principally what is furnished by the air, in cheap abundance; in the other case he is removing what is very costly.

"Hence in Nature a continual addition to the surface mould from the falling leaf and the decaying growth, and a gradual thickening of the surface soil or loam. Fertility is being continually stored in a form which protects against loss by evaporation and drainage in large degree. Under cultivation a continual abstraction, for man's use, of the fertility which has been prepared by the natural agencies of the past, and which is being added through decompositions and rain fall. Under this process, not only is there an exhaustion of plant-food going on, but the physical quality of the soil tends to change, and the oxidation of the humus disturbs the relations which have existed between the soil and the plant-food, and affects the retaining power and preparation power of the soil on the food to fit it for the plant.

"It is this disturbance of relation, the removal of plant-food beyond the annual supply of the weathering of the soil, and from atmospheric agencies, which constitutes the perils of agriculture. It is in the recognition of this difference between the history of the natural and the agricultural field that true agricultural science has its foundation. It is in the application of the facts of plant feeding and plant growth, as applicable to the artificial or man-created pursuit of agriculture, that we must expect that science applied to practice which shall develop profit for ourselves, without robbing our grandchildren.

"As concerning plant-food and agriculture, we have the following to consider: plant food, the soil, the plant, and man's interests and relations.

"Our attention being thus called to plant-food, we first note that we cannot consider it agriculturally as apart from its relations, and that its most striking feature, as a subject for thought, is in its changeability and variability; its gains and its losses; its Protean facilities for change. It is now a chemical element in the soil, inert and useless; again a food to an agricultural plant; soon formed into growth-tissue, and affording sustenance to man or beast, and again returned to the land. It now has one relation with the plant, and soon again another. Its position in the soil changes; its form is continually changing its relative proportions; and then again passing downward with the water, it is wasted, to be again saved in part by physical actions in the soil, and by the agency of plant-roots.

"Agriculturally we must define the capacity of our land by its relations to plant-food, and as in mechanics we require the measure of length, before we can give accurate expression to our ideas, so here we must have a measure for the agricultural capacity of our land; yet from the varying nature of the case, we cannot expect that exactness which is given by our foot-rule. The measure which we shall use for our purpose is the natural fertility and the maximum fertility of our land. We will therefore define these terms, so that we may not only see what they mean, but also realize their importance.

"The natural fertility of a soil is measured by the crop that may be grown out of the plant-food, which is liberated each year by the atmospheric and other natural actions in the soil, and which is supplied to the soil through the rain-fall. It may often be measured by a fallow.

"The maximum fertility of a soil is measured by the crop which can be grown from plant-food present in as great a quantity as the soil can retain without unnecessary waste. It may often be measured by that amount of crop which, labor being equal, can be raised most economically by an ample supply of fertilizer or manure.

"In ascertaining the value of a manurial application, it must be recognized that much of the effect depends on the season, on the culture, and on the seed. In practice, therefore, in order to determine the limit of production to our land, which we have defined as the maximum, we must take the average produce of a series of years, under well-defined and similarly-conditioned circumstances. Let us illustrate by supposed cases. I have a field which, with the ordinary rain-fall of my locality, will retain during the season of growth sufficient plant-food for the formation of a given crop of corn, and this fertility is thoroughly distributed through the soil, in such a manner that the roots of the plants will always be in contact at the proper time with the fertilizer, and can absorb sufficient to produce one hundred bushels of grain. Then the one hundred-bushel yield may be assumed as the maximum fertility of my field. My neighbor has a field, of a different character of soil, and applies the same quantity of fertilizer that I do, but his field has not the retaining power on the plant-food, and much is carried downward out of reach of the roots with the spring rains. He therefore harvests but fifty bushels of grain, and this represents the maximum fertility of his field. Now, if he fertilizes beyond the needs of this fifty bushels, he is meeting with a loss; if I fertilize beyond the one hundred bushels, I am meeting with a loss. If either of us fertilize below this respective maximum capacity of our fields, we are equally suffering a loss.

"Very likely in practice we both might get larger yields by applying more fertilizer than this maximum quantity, but in my case, all obtained over the one hundred bushels would be at a cost greater than the cost of the first one hundred bushels; in his case, all he obtained beyond fifty bushels would be at an enhanced cost over that of his first fifty bushels In practice, however, no farmer could figure as absolutely close as this illustration; but if we have clinched the idea, our purpose is accomplished.

"We now shall offer a few propositions concerning plant-food, agriculturally considered, which have been conclusively proved, and may be accepted as facts:

"1st. The soil contains plant-food.

"2d. The plant removes this plant food from the soil.

"3d. Analyses of plants will show the character and quantity of the plant-food removed from the land.

"4th. A supply of the elements removed by the plants to the soil, in such a way that they can be appropriated by the plants, will produce the plant-growth, under proper conditions.

"5th. Plants remove varying quantities of plant-food from the soil, according to their species, their manner of growth, and the proportions and quantities of plant-food present in the soil.

"6th. The constituents of plants furnished from the atmosphere being beyond our control, in studying plant-growth and food supply, we can limit ourselves to the earth alone, and study the air-supply only as modified by our control over the elements supplied to our land.

"7th. The soil contains the elements of plant-growth in varying proportions and conditions; some elements far in excess of the needs of our plant, other elements in quantities sufficient only to support a scant growth.

"8th. The plant-food in the land must, to be of service to the crop, be in a soluble state, or in a state capable of being taken up by the rootlets of our plants.

"9th. When the elements of plant-food, in the form of chemicals or dung, are added to our soil, there is a chemical action taking place between them and the soil constituents, in the presence of moisture.

"10th. The soil has the power of decomposing most of the chemicals which are applied, and has a retaining power on their compounds, varying with the character of the element.

"11th. As a rule, phosphoric acid is firmly held by the soil, and is not subject to loss through drainage, and has a limited diffusibility; potash is strongly retained, but has a greater diffusibility; nitrogen, in its various forms, is less strongly retained, and has a ready diffusibility.

"12th. In proportion to the presence of, and diffusion of these fertile elements in our soil, other conditions being favorable, will be the amount of our crop.

"13th. Waste of fertility in our land arises from drainage, and the changing of soluble plant-food into insoluble forms.

"14th. Plants require different proportions of plant-food, and different combinations, at different periods of their growth.

"15th. The presence of certain elements in excess has an influence on the growth and composition of the plant.

"16th. The seed has an influence, in itself, in determining the crop, an influence apart from the presence of a full supply of food, or the climatic features of the season.

"Let us see what are the logical deductions from these propositions. We cannot say that an application of a given quantity of plant-food to a given area of land will produce a given crop, because the crop depends not on the fertilizer which is applied to the land, but on that which is within reach of the crop, and which the crop can appropriate, besides the other questions of variety of seed, and the corresponding habit of the plant which is grown, and the influence of the culture, and the character of the season. We cannot advise the application of a single element of fertility, because the plant must have all the required elements to succeed, and we cannot know which one is deficient, or whether in applying the single element proposed, we are not destroying the balancement of fertility present in the field, or are not applying an excess of this element, which is to be wasteful. Indeed, by the application of a single fertilizer continuously, as superphosphate of lime, we are certain in the long run to injuriously disturb the balancement of food-supply, and cause in time a deficiency of some other element requisite for plant-food, which we have not supplied. As a matter of fact, we have heard of the use of fish-guano for a series of years, as having completely exhausted a field, notwithstanding the great crops produced by the first or second applications.

"Under this practice of the application of single elements of fertility to our land, an erroneous idea concerning manures and fertilizers has become popularized. Many, perhaps the majority of our farmers, regard commercial fertilizers as having peculiar and distinct properties from manures, and regard their use as either experimental, or else as fitted only for use in connection with barn-yard manure, or as they express it, as 'stimulants.' Now, an enlarged common sense, founded on experience and reflection, must convince that plant-food is plant-food, whether supplied in fertilizer or dung: that a pound of soluble phosphoric acid, supplied to the plant by a superphosphate, is an exact equivalent to a pound of soluble phosphoric acid supplied to the plant by dung, and so with the other elements. That it is an incorrect reasoning which compares dung, in its effects, which is a furnisher of a complete plant-food, with a single fertilizer which contains but one element of plant-food. The true criticism of fertilizers for general use must be based on their containing plant-food of all the kinds required by our crops; the true comparison must be between dung and a complete fertilizer.

"Our numbered facts, however, indicate an application of a fertilizer which cannot fail of success in growing our crops, even in competition with dung. If it is kept in mind that plant-food is plant-food, irrespective of source of supply, it cannot fail to be apprehended that crops may be successfully grown by the application of either dung or fertilizer of the proper kind, and that the conditions for success must rest on the methods we practice to bring our food within reach of the plants, and in that form which will enable them to be appropriated by the plant.

"The first essential to success must be in the use, the continued use, of a complete fertilizer in the quantity required by our crops. This fertilizer may be either dung or a mixture of chemicals, which shall contain the needed constituents. If we use dung, we apply similar proportions of plant-food to all our crops, because the composition of the dung depends not on what we desire, but upon the material upon which the animals have been fed who have produced it. It is a waste product of our barn economy. We mean nothing derogatory in this term, but simply the expression of a fact, a fact notwithstanding the leading importance of this product in our farm operations. In a chemically complete fertilizer we have a manufactured article in which the elements of the dung are present, and grouped according to the needs of our plants. We here reduce the chances of loss to a minimum, and escape the possibly injurious effect of an excess of one element producing a growth we do not calculate upon or desire.

"These are practical and theoretical views combined, and it lessens not their importance that New England farmers usually use their dung for crops which they feed out and convert into dung.

"Let us see now what we may expect reasonably, in accordance with our numbered propositions, from a complete manure.

"When our land is already at its maximum fertility, if we apply to this land annually the plant-food elements in the quantity removed by our crops, and in that form in which they can be appropriated by the crops, and in the form in which they will retain their appropriability, then we shall annually obtain the maximum crop from our land, and in this sense we can apply a given quantity of fertilizer for a given amount of crop, and expect that amount of crop at harvest.

"If our land is agriculturally barren, by the application of a complete fertilizer once, we may obtain a crop; but it may not be that amount of crop which we would figure from the proportionate elements supplied, because the elements would not be so distributed throughout the land as to be available, in their whole effect, to the plant. Yet the continued application of the complete fertilizer would, in the course of time, bring this land to its maximum fertility, and then we should expect to obtain a given increase from a given application, the given application being all along graduated to the agricultural capacity of the land.

"If the land be in an intermediate state, as most of our land is, the same principles apply.

"We thus see that, whether we use dung or a complete fertilizer, we may expect satisfactory results, provided we claim only those results which are justified by reason.

"It may be interesting to some to know how far experience corroborates these claims, which are the logical deduction from our tabulated facts. We are pleased to state that they are in exact accordance, and confirm our results at every step. The careful and exact experiments of Mr. Lawes, at Rothamstead, continued now for thirty or more years, show that on the dunged and chemically-fertilized plots, side by side, there is no difference in the amount of crop, but both alike produce to the maximum capacity of the land. The same facts are indicated in the farm practice of Mr. Prout, at Sawbridgeworth, England, a practice which has now been continuous for many years. The experience on Waushakum farm, South Framingham, although limited to two years, is also strongly confirmatory.

"It is certain that our reasoning is correct, thus confirmed by experience, but it is equally certain that to obtain the best results from either dung or fertilizer, some knowledge must be used. Let us consider the subject further, then, and see upon what principles our using of fertilizers must be based.

"The land must contain its fertile elements diffused throughout the root area, so that the plant may be provided with food at each absorbing rootlet during each period of its growth. To accomplish this is the great secret of success, and in order to accomplish it, we must have some knowledge of the action of each of the principal elements of fertilizers in the soil.

"The elements ordinarily requisite to be supplied to our land are phosphoric acid, potash, and nitrogen ; the other elements of plant-growth being either present in the soil in sufficient abundance, or not concerning us as necessarily being applied in the mixtures which we must use, in order to furnish the above-named substances.

"Phosphoric acid is one of the principal compounds of bone, in the form of a phosphate of lime, and is furnished to commerce either in bone, phosphate guanos, phosphate rock, or in the wastes of commerce. It occurs in three forms: an insoluble condition, in which it is unassimilable by the plant, a soluble form, wherein it is readily absorbed, and an intermediate form the reduced or reverted form, of the soluble, wherein its adaptability as plant-food is questioned, but which we esteem of some value, on account of the condition in which it occurs, and the conditions under which it is usually presented to the plant rootlets. It is commercially prepared from bone or phosphate rock, by the addition of sulphuric acid, which, uniting with a portion of the lime with which the phosphorus is combined, leaves a soluble form. The reaction may be expressed as below :

$$\begin{array}{ccccccc} \text{Bone ash.} & & \text{Sulphuric acid.} & & \text{Superphosphate of lime.} & & \text{Sulphate of lime.} \\ 3\ \mathrm{Ca\ O,\ P\ O_5} & + & 2\ (\mathrm{H\ O,\ S\ O_3}) & = & 2\ \mathrm{H\ O,\ Ca\ O\ P\ O_5} & + & 2\ (\mathrm{Ca\ O\ S\ O_3}) \\ \left.\begin{array}{c}\text{Three atoms of lime,}\\ \text{combined with phos-}\\ \text{phoric acid.}\end{array}\right\} & & \text{Diluted sulphuric acid.} & & \begin{array}{c}\text{Superphosphate of lime,}\\ \text{united with water.}\end{array} & & \text{Gypsum.} \end{array}$$

"This product, the superphosphate, is the valuable portion of the fertilizers placed on the market under this name, and it may compose from ½ per cent. to 23 per cent. of their mass by weight of soluble phosphoric acid. We thus see the importance of the sale of fertilizers by guaranteed analysis under government control. Ordinarily, a good superphosphate will contain about 10 per cent. of soluble phosphoric acid, and a few per cent. of nitrogen, in addition to insoluble and reverted phosphoric acid. We can estimate its value on the basis of 12 cents a pound for the soluble phosphoric acid, from 4 to 6 cents a pound for the reverted, and 1 or 2 cents for the insoluble. Yet these figures are subject to changes.

"When this fertilizer is applied to our land, and the rains fall, it is washed into the soil, but only to a certain distance. The soil has a retaining power on this element, and holds it firmly against washing. So far as the phosphoric acid extends through the soil, it is diffused: that is, it is evenly distributed, and the soil holds it in saturation, but in a quantity for a given area dependent on the nature of the soil. What follows from this? If we apply a given quantity to the surface of our land, a quantity sufficient if *applied to our plant* to raise a maximum crop, so far as this constituent is concerned, the rains wash it down, and it is retained, we will suppose, by the first inch of our soil. Now, as it is retained by the soil in this position, despite the rain-falls, it is evident that in this supposed case, *only the root fibers which enter this upper inch of earth can feed on it.* If a double quantity be applied, then it will extend down two inches, and the same facts about the plant feeding holds for this two inches, and so on. It is evident that it can only be by applying phosphoric acid in large quantities, or repeatedly during a series of seasons, that we can so saturate our land with this element, *under these assumed conditions*, as to furnish the whole root-area with plant-food.

"These considerations would lead us into the practice of looking for the full effect of this fertile element from repeated applications, rather than from a single trial. They would also lead us to apply this element within reach of the principal plant fibers in all cases. They show us that it is safe to apply a superphosphate at any period of the year, so far as loss by drainage is concerned. In applying on sod for corn, we like to apply this element of our fertilizer on the surface, so that it may be washed in by the rains before ploughing. Then when the sod is inverted, shallow, as is our custom, the fertile strata of earth is in the right position for the roots.

"We also have an action of the acids of our combined fertilizers in rendering more soluble the phosphoric acid which has reverted in the soil, but space will not admit of further considerations.

"Potash, as supplied in commerce, occurs in three forms,—the carbonate, sulphate, and muriate. The first form occurs in ashes, and we will suppose a bushel of ashes to weigh 48 lbs. to the bushel, as has been determined as the average for house ashes as they usually occur. Now ashes contain about 6 per cent. of potash, and about 2 per cent. of phosphoric acid, in a reduced or insoluble form. Hence a bushel of ashes would be held as of the value of 2.8 pounds of potash and .9 pounds of phosphoric acid. If these ashes are worth 30 cents a bushel, and we consider the phosphoric acid worth 6 cents a pound, the potash in our ashes stands us at about 8¾ cents a pound. If leached ashes are used, at 10 cents a bushel, the potash supply is costing about 20 cents a pound. Carbonate of potash is, however, a good form in which to use potash, as the carbonic acid has an action of itself in the soil, in aiding the solution of plant-food.

"Of late years, however, the principal agricultural supply of potash is looked for in Kainite or German potash salts. These are the product of the salt mines of Germany, and are put on the market in the form of sulphate of potash and muriate of potash of varying strength. The most economical for the farmer are the high grades. The sulphate of potash which contains 78-80 per cent. of the pure salt, furnishes about 43 per cent. of actual potash, and when the commercial salt is quoted at 4 cents a pound, the actual potash therefrom is costing about 9 ⅓ cents a pound. Muriate of potash, the other potash salt of these mines, when of 80 to 85 per cent. muriate, contains about 50 pounds of actual potash, and furnishes, when the commercial article is selling at 3 cents a pound, the potash at about 6 cents a pound. We thus find that the cheapest supply of potash is in the high grade muriate To furnish the potash at the price it is procured for in the muriate, we should buy the sulphate of the same grade at about 2½ cents a pound, and wood ashes at about 17 cents a bushel.

"These salts of potash are supposed to act differently on crops, but we do not consider the matter at all proved at present. Indeed, at present prices, we prefer to apply the muriate in nearly every case, or, better still, two thirds muriate and one third sulphate. This for reasons that we shall not attempt here to offer.

"When we apply our potash compounds to the land, they become dissolved by the rains, and wash into the soil. They are then decomposed into their constituent parts, separating into sulphuric or muriatic or carbonic acid, and potash, and while the acids are not retained at all closely by the soil, but follow the water of drainage until they meet new compounds, and are subject to different actions, the potash is quite strongly retained. It is, hence, easier to saturate our soil with potash than with phosphoric acid, and if our soil is deficient in this element, we can hope to more speedily cause it to be diffused through the soil, and thus become more accessible to the crops. In applying potash, then, we desire to keep it near the surface at first, as we are quite certain it will pass downward into the root pasturage, and we are never quite sure against a small waste.

"Nitrogen is the expensive element of plant-food. As usually supplied, it is in the form of ammonia, or a nitrate, generally nitrate of soda. When sulphate of ammonia is the source of supply, and our crude material contains about 25 per cent. of ammonia, each 100 pounds furnishes 21 pounds of nitrogen, which costs, when the crude material is selling at 5½ cents a pound, about 26 cents a pound. Nitrate of soda of commerce, 95 per cent. purity, furnishes about 17 per cent. of nitrogen, which, when the nitrate is selling at 4 cents a pound, stands us in at about 24 cents a pound. Nitrogen is also obtained from many wastes, notably from dried blood. When dried blood contains 14 per cent. of ammonia, it furnishes about 11¾ per cent. of nitrogen, and this costs about 24 cents a pound, the blood being purchased at 3 cents a pound.

"It makes some difference to the crop in what form of combination our nitrogen occurs, because some plants feed on different combinations at different periods of their growth. Yet the discussion of this point further is outside of the scheme we have laid down for this essay.

"When a nitrogen salt is added to the soil, it becomes decomposed in the presence of moisture, the acid constituent passes quickly through the soil, while the base, if ammonia, is retained to a certain extent, but not as strongly as phosphoric acid or potash. It is, hence, quite readily diffused through the soil, and is quickly supplied to the roots of our plants. Hence, in using a nitrogenous fertilizer, we can anticipate speedy results. It is, however, on this very account, subject to waste, and on account of its costly nature, it is the farmer's duty, while supplying it in abundance for the wants of the plant, to beware of any excess.[*]

"Having now treated briefly these three important elements of plant nutrition—phosphoric acid, potash, and nitrogen—we will remark that, oftentimes, their price may be cheapened by buying them in combination, as in ammoniated superphosphates, animal fertilizers, or Peruvian guano. Oftentimes they may be procured in a local waste, as in the refuse of powder factories, of woolen mills, etc.; often, indeed, in purchasing dung, for, be it remembered, the agricultural value of all fertilizers, including dung, is largely in the plant-food they contain.

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[*] "To show the effect of exposure on the ammonia in manures, as previously discussed, we give Dr. Voelcker's determination on fresh horse-dung as gathered from stables, before being mixed with the heap.

"In his experiment, the percentage of ammonia which was drawn out by *long-continued* boiling, amounted to 0.0033. This would be .066 lbs. of ammonia a ton. As ammonia can be purchased for about 20 cts a lb., the greatest possible loss would be 1 32·100 cts a ton The loss in practice, however, would not equal this which was obtained by means of boiling water.

"A second sample of hot fermenting horse-dung, emitting a strong and pungent smell, contained in like manner 0.049 per cent. of free ammonia in .98 lb., which would be worth, if all lost 39 2-10 cts per ton of dung. Yet as this dung is soon cooled, when spread and the land is absorptive, would indicate a loss in practice, too small to be taken into consideration when the increased economy of spreading dung when convenient, instead of a fixed time, is taken into consideration.

"In ordinary barn manure, the loss would be even less than here represented."

"We have now completed the line of thought which we laid out at the commencement, but we cannot close without a brief recapitulation of a few of the points that are certainly true. First, that it is the plant-food which concerns the farmer, not the name. Second, that chemicals are capable of being profitably used on the farm. Third, that the good farmer can afford to buy and use fertilizers whenever he desires to till more land than his dung-heap will admit of his doing.

"One word more. Scientific farming, the bugbear of the practical man—what is it? Why, only this, and nothing more. The applying of knowledge gained from experience in an understanding way. Is there anything very bad about this? The man who knows what to expect from his acts, of necessity acts with more advantage than the man who acts at haphazard, and trusts to Providence.

"This paper, friends, was written for a purpose. Not only to show what may be expected from the judicious teachings of science, as demonstrated by practice; not only to point out to you additional ways of deriving more profit from farming, but for a personal reason in addition. By some, by many parties who have read my writings with too little care, I have been classed as a disciple of a certain theory, which has occupied much of the public attention for the past few years. I desire to put my own views on record, in order that you all, who are interested, may see just what my views are on this important subject of fertilizers and fertilization. I desire it to be plainly understood that I am the disciple of no one theory or set of theories but my own, which are deduced from the actual facts of experiment and research, as I interpret them. Professor Stockbridge is doing notable work for agriculture, and deserves high praise for his practical success. We differ from him friendlily in his explanations of his results, but we agree with him cordially in the belief in the beneficial effects which follow from his system of fertilization. In a word, the facts of his methods mark a new departure, and open a revival of agriculture, which will soon, we trust, become so general as to make our fields pour forth of their harvest, and our barns swell with their fullness, and the farmers' hearths light up families joyous in their successes and prideful of their opportunities.

"Prof. ATWATER. Dr. Sturtevant has touched upon a very important topic for Connecticut farmers and for all the farmers of those portions of our country where the soil is reduced by cropping or neglect. I refer to the cost of the valuable ingredients of our commercial fertilizers. A very important point to the farmer who purchases these chemicals, nitrogen, phosphoric acid, and potash, to supply the food that his crops need is, that he may get them in the best form and at the lowest cost. Here you see some bottles—perhaps a hundred or more. These contain samples of commercial fertilizers which have been analyzed during the past year at our Experiment Station. They are such as are sold to and used by our farmers in Connecticut, who pay for them prices varying from twelve dollars to one hundred dollars a ton, buying them as superphosphates, bone manures, guano, fish manure, sulphate of ammonia, nitrate of soda, and so on.

"I have in my hand a material for furnishing phosphoric acid, or 'plain superphosphate.' It is not an ammoniated superphosphate; it is what is called 'acid phosphate.' There are several grades of these things, furnishing various percentages of soluble phosphoric acid. Some of them are made from the South Carolina phosphatic rock; some of them are made from bone-black; some are imported from England. They are offered in the market at various prices, from twenty-five dollars to sixty dollars, and sixty-five dollars a ton. Generally, the dearest ones, estimated by the cost per ton, are the cheapest for you to buy, if along with the price you take the number of pounds of soluble phosphoric acid in a ton. This latter you can readily calculate by taking the per cent. and multiplying by twenty. As, for instance, assuming that a superphosphate contains ten per cent. of phosphoric acid, a ton of two thousand pounds will contain twenty times that. You get, then, in a ton, two hundred pounds of phosphoric acid. Now, you may pay thirty dollars for that two hundred pounds, and have it cost you fifteen cents a pound, or you may buy a higher-grade article and get it for considerably less.

"There are articles offered in the market (I have never got hold of them, but have seen them mentioned) which are said to contain nearly thirty per cent., nearly six hundred pounds in a ton, of phosphoric acid, and sold at sixty-five dollars a ton, or thereabouts, giving you soluble phosphoric acid at somewhere between ten and eleven cents a pound. The farmers of Connecticut have been paying, for soluble phosphoric acid, if we may judge from the analyses of the articles that have been brought to us by them, from twelve cents up to fifty cents a pound; and there are a number of our standard superphosphates, that are sold by hundreds of thousands of tons throughout the country, the soluble phosphoric acid in which costs the purchaser fifteen and even twenty cents a pound.

"Take the matter of nitrogen. The cheapest nitrogenous fertilizer that you can get in this State to supply nitrogen is fish scrap. That will furnish you nitrogen and phosphoric acid; not soluble phosphoric acid, but phosphoric acid that is in a state that becomes soluble quite readily. It is on the whole quite available, though not so available as soluble phosphoric acid. We have had a number of samples of fish manure, some 'dry' and some 'half dry' fish, containing phosphoric acid and nitrogen in such form that those who bought them paid only ten to fifteen cents a pound for the nitrogen, while in many of the fertilizers sold in the State the nitrogen costs from thirty to forty cents per pound. In one or two articles that have come under our notice it has cost the farmer over a dollar a pound.

"Now, it is a matter of some importance to you, when you go to the store and buy nails, to know whether you are paying four cents or forty cents a pound for your nails, is it not? You can see the nails weighed right out before you; it is no use for the dealer to try to cheat you, because you can weigh those nails yourself. You cannot weigh the nitrogen or the phosphoric acid in these fertilizers; but correct analyses will show you what they contain.

"It would be improper for me to go very far into this subject now, because I have no right to trespass upon your time, and because accounts of the articles referred to will be given in the reports of the Station. Allow me, however, to call to your notice a few articles that are, I believe, worthy of much more attention than they have received hitherto, from the farmers of Connecticut. Among these are nitrate of soda, of which you see specimens in these bottles. They are both valuable for the nitrogen they contain, which being in the form of nitric acid in the one and ammonia in the other, is in both cases in its most available condition. They are sold at prices such as to bring the nitrogen at about twenty-five cents per pound. They are both finely pulverized, dry, clean, and easily handled and applied. They are excellent for top-dressing to bring lagging crops along, as in the case of Mr. Webb's aftermath, and for mixing with superphosphates.

"The dried blood and meat scrap produced at some of the slaughtering establishments in our large cities are also worthy of attention. They are sold at prices which bring the nitrogen at less than twenty-five cents per pound. They are not as rapid in their action as sulphate of ammonia or nitrate of soda, but still they are quick-acting fertilizers. In some cases the dried blood, meat and bone, produced at the slaughter-houses are mixed together before or after drying and sold as 'animal fertilizers' and 'animal dust.' Sometimes the bones are treated with sulphuric acid to render the phosphoric acid soluble. These articles have been sold during the past season at prices which bring the nitrogen at twenty cents, and soluble phosphoric acid at twelve cents, or less, per pound. Our best 'ammoniated' superphosphates are made from bone as a source of phosphoric acid, and slaughter-house refuse or fish as a source of nitrogen. By purchasing the fish or slaughter-house refuse, and the dissolved bone or other high-grade superphosphates, the farmer can prepare his own fertilizers at a cost lower than he would get the same articles at in any but the very best nitrogenous superphosphates.

"I receive a great many inquiries about the values of bone-manures. Various grades come to our laboratory for examination. There is a great deal of pure bone and a great deal of impure bone. The bone, as such, furnishes often valuable ingredients, phosphoric acid and nitrogen. A good quality of pure bone ought to furnish from twenty to twenty-six per cent. of phosphoric acid; the nitrogen, according to our analyses, varies from three and a quarter to three and three-quarters per cent. There is a great difference in the fineness of the different grades of bone. Here is a sample of which most of the fragments are quite coarse, many as large as grains of wheat, or peas, while a very little is as fine as ordinary flour. Here is a specimen, of which nearly the whole is as fine as flour. Nearly all of the material would pass through an ordinary flour sieve, and much of it is as fine as the dust you sweep up on the floor. Now, you can readily see that this finer material will be more uniformly diffused and quickly decomposed in the soil, and is consequently much more readily available than the coarser materials. Generally the finest bone is that which has been steamed at high pressure. By this process the fat is removed and the bone left in condition in which it can be easily ground. The fat has no value as a fertilizer. It consists of carbon, oxygen, and hydrogen, which came originally from the air and need not be returned to the soil. The steamed bone is generally quite soft and ground fine. Here is a sample, of which there are scarcely particles as large as a grain of wheat, and most is so fine that when I open the bottle and shake it you see a cloud of fine bone-dust rising. The coarser particles are so soft that when I press them with the flat side of my knife-blade, as you see, they are crushed almost as easily as wax. Now such an article as this is ground very fine at small cost, and when applied is thoroughly diffused through the soil, and readily decomposed, and becomes quickly available to the plant. But the grinding of the raw bone is much more expensive; it is rarely ground so fine, and its action is much slower. If you wish for a lasting effect it will do of course to use the coarse bone, provided you can get it enough cheaper to make up for the loss from the capital invested lying idle so long.

"In buying bone, then, we should make sure that we get either pure bone, or that if it is not pure we pay no more than the valuable material actually present is worth to us. For quick action select the finest bone; for slow action take the coarser, provided it comes enough cheaper to make up for interest on the cost. In Germany, where the experience with fertilizers has been much more extensive and accurate than here, the farmers pay fifty per cent. more for the fine bone-dust than for the coarser raw bone.

"Mr. DAY. How can the farmer distinguish between the pure and the impure?

"Prof. ATWATER. Without analysis it is often difficult. A pure bone will contain from, say twenty to twenty-five per cent. of phosphoric acid, and from three and a quarter to three and three quarters per cent. of nitrogen. The samples we have analyzed run from nineteen and a half to twenty-six per cent. of phosphoric acid. But a good many bone-manures, so-called, contain from ten to sixteen per cent. of phosphoric acid only. These contain some foreign material. This latter may be animal matter, such as dried blood, meat scrap, &c., which are very valuable fertilizing materials because of the nitrogen they contain. The effect of adding them, of course, is to decrease the percentage of phosphoric acid and increase that of nitrogen. But other materials, such as salt cake, oyster-shells, plaster, lime, which have very little fertilizing value, are often used to adulterate bone. These decrease the percentage of phosphoric acid without increasing the nitrogen.

"Now when you can get pure, fine bone-dust, at forty dollars per ton, which is worth fifty per cent. more than the coarse, raw bone, why pay from forty dollars to forty to forty-eight dollars per ton for the latter, particularly when other materials of little or no value are mixed with it? This last is just what you good farmers in Connecticut have been doing for some time past.

"I would like to call your attention to one or two waste products, of which I have samples here. Here are some hoof-shavings, a material about whose composition very wrong impressions have obtained. Some farmers have supposed it to be similar to bone, and have used it as they would bone. It is very different from bone, however. It contains scarcely any phosphoric acid but is very rich in nitrogen. This sample gave on analysis one-tenth of one per cent. of phosphoric acid and nearly twelve per cent. of nitrogen. As a source of nitrogen, where slow action is wanted, it is to be recommended quite highly.

"One of the gentlemen present sent for analysis what is called 'hair-manure.' I have a sample here, which came from Peter Cooper's glue factory. It is a mixture of hair, pieces of bone, and some fragments of other materials which look like leather, but are said to be pieces of hoof and glue. The bone has been either boiled or steamed, and is very soft indeed, and it will decompose readily. This particular specimen that I have here contains five and three-quarters per cent. of nitrogen, and about one and a quarter per cent. of phosphoric acid. As a source of nitrogen, it is one of the waste products that are valuable.

"I am frequently asked, 'What is the cheapest fertilizer?' Estimating by the cost per pound of the valuable ingredients, by far the cheapest fertilizers that have come to our Station for analysis are, as I have said, the fish-manures, either half dry or dry. Generally, the half dry has been somewhat cheaper, although that is of extremely uncertain position. The next cheapest fertilizer that we have had is Peruvian guano. I do not like to make specific comparisons of materials that are manufactured by parties who are in any way rivals, but Peruvian guano is an article of national importance, and one with respect to which there is not that competition which we find in other fertilizers; I trust, therefore, that it will not seem improper for me to speak of it here.

"Three brands of No. 1 Peruvian guano are now offered in the market: the '10 per cent. Ammonia Standard,' the Guaranteed, and the Rectified. The first or 'raw' guano is guaranteed to yield 10 per cent. of ammonia by the cargo. Individual lots vary somewhat from this. Some bags contain more and some less than this, but the specimens we have analyzed average enough nitrogen to be equivalent to rather more than 10 per cent. of ammonia. They have yielded from 13 to 18 per cent. of phosphoric acid, and from 3¼ to 4½ per cent. of potash. These ingredients are all in quite available forms, and, at the prices at which it is sold, the 10 per cent. Ammonia Standard is a very cheap article. I wish to call your especial attention, however, to the two other brands, the 'Guaranteed' and the 'Rectified.' The 'raw' guano, as we have seen, is of somewhat variable composition, and, as you know, contains occasionally small stones which are of no value, and lumps of guano which, though very rich in fertilizing materials, are hard to pulverize.

"In preparing the 'Guaranteed' brand the stones and lumps are removed by screening, the former rejected and the latter pulverized and added to the fine material, and the whole mixed so as to produce an article of uniform composition. In preparing the 'Rectified,' besides separating stones, pulverizing and mixing uniformly, sulphuric acid is added to render the phosphoric acid more soluble, and to fix the ammonia, a portion of which is liable to loss on standing. Both of these brands, the Guaranteed and the Rectified, are sold upon the basis of their actual composition, the analysis being branded on each bag; that is to say, they are guaranteed to contain such-and-such percentages of nitrogen, phosphoric acid, and potash. A particular price or valuation is assumed for one pound of each of these ingredients. The value of a ton is calculated on that basis, and the article is sold at the price thus computed.

"The average cost of the valuable ingredients in the Peruvian guanos which have been analyzed at the Station, is less than in any other class of manures that have come under our notice, except, as I have said, crude fish scrap, which, considering that its composition is so variable, and is not guaranteed, and that its importance is only local, ought, perhaps, to be excluded from the comparison. In the Rectified, the cost of nitrogen had come to only 18.2 cents, and the soluble phosphoric acid only 10.3 cents per pound. Had our Station been called upon to prescribe how Peruvian guano should be prepared and sold, I do not see how it could have suggested any plans more desirable in themselves, more fair to purchasers, or more beneficial in their influence upon the sale of fertilizers in the country.

"If, in buying commercial fertilizers, you could always find on each package a guaranteed statement of the composition, and the price were regulated by the composition, you would know what you were paying for the valuable materials you buy, and feel sure you were getting the worth of your money.

"In fact, the only just way to buy and sell fertilizers, is on the basis of their actual composition. I trust the farmers in this Convention and elsewhere will be in favor of this basis of trade in commercial fertilizers, and that by this, and every other legitimate means, all dealers may be led to do what the more substantial ones are doing already, namely, to 'state what they sell and sell what they state.'

"Mr. WETHERELL. Can you tell us the value of stable manure, such as is sold in the market, as compared with No. 1 guano?

"Prof. ATWATER. It is impossible to answer the question accurately. It is easy to analyze a given specimen of guano, and find out how much phosphoric acid and nitrogen and potash, or other ingredients, it contains; we may likewise analyze a given specimen of stable manure, and find how much of different ingredients it contains. Analysis will show, as we well know, that the composition of stable manure varies greatly, much more than the guano, and that it is a complete manure, furnishing all the ingredients of plant-food, while guano is a special fertilizer, and furnishes only part of the list of materials that plants need for their support. Hence stable manure is worth more as a general fertilizer, because it is useful in all cases, and safer. Still further, stable manure contains a much larger proportion of organic matter of undigested vegetable material, which has a very decided fertilizing value on account of its indirect action upon the soil, and outside of that which comes from the direct supply of food to the plant. This beneficial effect is quite variable, and when you ask me what is its value in dollars and cents, I can only answer that I do not know.

"Mr. WETHERELL. I think it is an important question. The stable manures have a commercial value, but it makes considerable difference whether the manure from a stable be from horses and cattle fed with fine hay and grain, or from animals that are fed simply with coarse hay. But what I want to call the attention of farmers to is, the fact that I think they are paying a great deal too much for stable manure, according to its relative value compared with these other fertilizing ingredients.

"Now, I want to ask another question. It will be remembered that Dr. Sturtevant stated, at least I so understood him, that if all the elements of barn-yard manure could be brought into a chemical fertilizer, we could use that fertilizer instead of barn-yard manure. But I understand Prof. Atwater to say, that barn-yard manure has something in it beyond that—something which does good, that is not found in the fertilizers. I want to inquire whether that point is one which is tenable.

"Prof. ATWATER. I believe it is, unquestionably, although I cannot estimate, in money, the value of it. The subject is one about which no mortal has absolutely definite knowledge as regards any one special case, and the cases are as varied as the materials, and the soils and conditions in which they are used. It is one of those things, therefore, about which it is simply foolish to attempt to speak definitely. We know it to be a fact, however, that the action of barn-yard manure, like that of vegetable mold, is often very useful in itself, independently of its direct supply of food to the plant. The fertilizing action of dung is of two sorts: the direct, in furnishing its own nitrogen, phosphoric acid, lime, potash, and other ingredients of food to the plant; and the indirect, in aiding the soil to supply food and improving its condition as a place of abode for the plant. The same is true, though in less degree, of commercial fertilizers. You know that the theory was held for a long while that the fertility of the soil was due to the humus, the partially-decayed vegetable matter which it contains or receives in the form of manure. This theory could not have maintained itself so long had there not been considerable truth mingled with the errors it involved. For instance, it is well known that organic matter on the surface of the soil tends to retard evaporation of water, and thus to keep it in a more moist condition in times of drought. The physical condition of soils is much improved also by this organic matter. In the process of its decomposition in a heavy soil, the latter is 'warmed,' loosened, made lighter, more opportunity is given for the circulation, not only of air and water, but also of the carbonic acid which is generated. These materials in their turn aid in the decomposition of the material of the soil. Thus the potash, and phosphoric acid, and lime, and other ingredients of plant-food which are locked up in the soil, are made more available to the plant. Such are some of the ways of the indirect effect of barn-yard manure. The indirect action of guanos and artificial fertilizers is also useful, but it must be far less so than that of barn-yard manure. We have, however, no means of estimating accurately the value in either case.

"Mr. DAY. You speak of Peruvian guano as one of the cheapest fertilizers that we can buy. Would you advise the repeated application of Peruvian guano to the soil? Would not repeated and heavy applications of it destroy the organic matter in the soil?

"Prof. ATWATER. No, I would not advise it, and for this reason: Peruvian guano is a stimulating article. It is said over and over again that it wears out the soil. I believe it. While it supplies a good deal of nitrogen and phosphoric acid, it furnishes but little of the other materials that the plant must have for its food. It aids at the same time in rendering available the store of other materials present in the soil, and gradually, by its continued use, the supply of other materials already available, or capable of being quickly rendered available, is reduced below the point of profitable production. Under the stimulating effect of the guano the soil yields abundantly for a time, but after awhile, its power to furnish the material the guano lacks is reduced, and the crops fail. And the same thing is true of blood manures, and superphosphates, and fish. One of the workers in our Experiment Station comes from Maine, where herring have been long used for fertilizers. He says his father used to tell him about land that had been long ago 'herringed to death.' That is one great trouble with our commercial fertilizers.

"Let me give you one illustration, which I have from a good, sensible farmer from the western part of the State. Said he, 'A farm near by mine had been run down, just as a great many farms have been, by long cropping with little manure. A man came up from the city and bought that farm, and made up his mind that he would bring it up with superphosphates, guanos, and things of that sort. So the first year he laid out $400 for special fertilizers, and got rather better crops than the farm had yielded the year before. But the next year his guanos and superphosphates did not help him at all; he was worse off than he was when he started." Now, from the chemist's stand-point, that is just as easy to understand as that twice two are four. Of course I do not know what was the condition of that particular farm. I believe it had been worked down by cropping until the available supply of some of the ingredients of plant-food had been pretty well used up. Very likely it may have been deficient in potash. The guano and superphosphate were applied, the poor worn soil was stimulated to one more feeble effort, and then its strength was gone. The guano supplied phosphoric acid, lime, and nitrogen, but very little magnesia, potash, or sulphuric acid. It is quite probable that if the German potash salts, particularly those that contain sulphuric acid and magnesia along with the potash, had been used along with the guano, the result would have been just the opposite.

"The point I wish to urge is this: These fertilizers that we ordinarily buy—the bone, the guano, the superphosphates—are one-sided things. There are farms that will stand the application of superphosphates year after year, and furnish enough of the other materials to give you good crops; and there are others that will not. The moral of all this is: If you want to know what will be the best thing for your soil, you must study it, experiment with it, try this thing, that thing, and the other thing, and see which does work best.

"Prof. STOCKBRIDGE. Take the very case you have in hand. The sowing of Peruvian guano and superphosphate resulted practically in a failure of the crops. Supposing the farmer had taken his Peruvian guano and superphosphate and had cropped his land in the ordinary course of culture; as, for instance, planted a crop of corn, and then seeded his land down to clover, filled the soil with clover roots, letting the clover remain and mowing it one or two years, and then turning it over—would not the result have been the same as though he had applied barn-yard manure, or nearly so?

"Prof. ATWATER. The same; or nearly the same, how nearly, depending on circumstances. Your barn-yard manure would furnish nitrogen, phosphoric acid, potash, lime, and magnesia, and so on; and your clover, after awhile, would gather a good deal of potash and lime and phosphoric acid by sending its roots away down and bringing these materials up, and by gathering nitrogen from the air. Undoubtedly, the roots of the clover, remaining in the soil, would do essentially the same work that the barn-yard manure would have done by its fermentation. In principle, in kind, the result would be the same. The question is as to the degree—as to the number of pounds of nitrogen, phosphoric acid, potash, lime, and magnesia you would have got from your barn-yard manure, and how many pounds you would have got from your clover, and how much indirect effect you would get from each; and that depends a great deal upon your barn-yard manure and clover.

"Prof. STOCKBRIDGE. Your clover has a fixed composition.

"Prof. ATWATER. It has a fixed composition, but not a fixed quantity. It depends upon the roots as well as the tops, and nobody knows how deep the roots of clover go under different circumstances. That is one of the questions we need to investigate. We have been at work on it for some time at our Station. But there is no doubt that the plan of which you speak of improving the fertility of soils by clover is an excellent one."

THE CULTIVATION OF TOBACCO.

The net money crop of Kentucky, *par excellence*, is undoubtedly tobacco. Not that hay, grass, corn, and wheat are not to be ranked above it in usefulness; but, as a commodity for exchange, tobacco has, and will continue to hold, a most prominent position among our agricultural products. The soil, the climate, and the plant-food contained in the underlying rocks of Kentucky, are all peculiarly suited for the production of the tobacco plant. Custom, too, has long familiarized our people with the cultivation of the weed, so that it is now impossible to discontinue its tillage. The plant is a native of all parts of the North American continent, from the equator to the 40th parallel of north latitude. Within three hundred years its consumption in the world has grown from nothing, until now over 1,200,000,000 of pounds are produced and consumed. Over one third of this amount is grown in the territory of the United States and the West India Islands, which are the great tobacco-growing countries of the world. Kentucky leads all her sister States in its production, annually creating for market from 130,000,000 to 170,000,000 of pounds, or nearly one half of the entire crop of the United States. The area of land devoted to the active cultivation of tobacco in the United States is not over 500,000 acres, while the money value of the crop varies from twenty to thirty millions of dollars.

Next to food and raiment, probably tobacco is more esteemed than any other commodity known to commerce. It is estimated that more than 600,000,000 of the human family are addicted to its use in one shape or another—no people being exempt from its narcotizing influence.

The common people of every nation on earth find consolation in the fumes of this weed, while the rich of every land esteem it one of the greatest of luxuries. It has been not inaptly called "the elixir of the rich and the anodyne of the poor." This plant was found in general use among the natives or aborigines of the West India Islands, and of those along the coast of the main land from Florida Keys to the Delaware river, upon the first visit of Europeans to this continent in the beginning of the sixteenth century, and the calumet or pipe of peace was everywhere used whenever formal visits were made between the chiefs of different tribes, or treaties of peace were negotiated.

During the voyage made by the expedition fitted out under the patronage of Sir Walter Raleigh, in 1584, Virginia was discovered. Hariot, who was with the expedition, published, in 1588, "A Briefe and True Report of the New Found Land of Virginia." Of tobacco he makes the following mention: "There is an herbe which is sowed by itselfe, and is called by the inhabitants *uppowoc*. In the West Indies it hath divers names, according to the severall countries where it groweth and is used; the Spaniards generally called it *tobacco*. The leaves thereof being dried and brought to powder, they use to take the fume or smoke thereof by sucking it through pipes made of clay into their stomacke and heade, whence it purgeth supurfluous fleame and other grosse humours; openeth all the pores and passages of the body, by which means the use thereof not only preserveth the body from obstructions, but also, if any be so that they have not beene of too long continuance, in short time breaketh them, whereby their bodies are notably preserved in health, and know not many grievous diseases wherewith we in England are oftentimes affected. This *uppowoc* is of so precious estimation amongest them that they thinke their gods are marvellously delighted therewith; whereupon, some time, they make halowed fires, and cast some of the powder therein for a sacrifice. Being in a storme uppon the waters, to pacifie their gods they cast some into the aire and into the water; so, a weare for fish being newly set up, they cast some therein and into the aire; also, after an escape of danger, they cast some into the aire likewise; but all done with strange gestures, stamping, some time dauncing, clapping of hands, and staring up into the heavens, uttering therewithal and chattering strange wordes and noises. We, ourselves, during the time we were there, used to suck it after their manner, as also since our return, and have found many rare and wonderfull experiments of the virtues thereof, of which the relation would require a volume by itselfe; the use of it by so manie of late, men and women, of great calling as else, and some learned phisitions also, is sufficient witness."

William Strachey, the first Secretary of the Colony, wrote in 1610 the following about tobacco: "Here is a great store of tobacco, which the salvages call *apooke;* howbeit, it is not of the best kind; it is but poor and weake, and of a biting taste; it grows not fully a yard above ground, bearing a little yellow flower like to henbane; the leaves are short and thicke, somewhat round at the upper end; whereas, the best tobacco of Trynidado and the Orinoque is large, sharp, and growing two or three yards from the ground, bearing a flower of the breadth of our bell-flowers in England; the salvages here dry the leaves of this *apooke* over the fier, and sometimes in the sun, and crumble it into powder—stalks, leaves, and all—taking the same in pipes of earth, which they very ingeniously can make."

Sir Ralph Lane, first Governor of the Colony, and not Sir Walter Raleigh, appears to have the honor of introducing tobacco into England. Captain Yeardley, Deputy Governor in 1616, directed the colonists to plant tobacco as a crop that promised good returns, and this year witnessed its first planting by white men in Virginia. According to Hamor, John Rolfe (the husband of Pocahontas) was the man who "took the lead."

The general system of tobacco culture has changed very little during the last one hundred and fifty years. For the gratification and instruction of the curious, I will here copy a letter from Richard Parker, Esq., of Lawfield, Virginia, directed to the President of the Philadelphia Agricultural Society, of which Benjamin Franklin was then an active member. This letter we find printed in the "*American Museum*," 1789. The instructions given in this letter, with but few alterations, will answer for a guide in tobacco culture at this day:

ACCOUNT OF THE CULTURE OF TOBACCO NINETY YEARS AGO.

"I have great pleasure in gratifying your desire of being informed of the culture of tobacco—an art that every planter thinks he is a proficient in, but which few rightly understand. A man who wishes to make fine tobacco should be particular in the choice of his seed. I mean as to the kind. I do not know a greater variety of any kind of vegetable than of tobacco; from the sweet-scented, the best sort, to the thick-jointed, a coarse kind of tobacco; but of which I think the most can be made. I would recommend to a gentleman who would wish for the reputation of a good planter to cultivate the true sweet-scented.

"When he has chosen his seed let him prepare the beds in which he intends to sow it, very fine; when thus prepared they must be burned with corn-stalks, in order to destroy the seed of weeds and grass, which, even when he has done the best with his beds, he will find very troublesome and difficult to extirpate. The best time for sowing the seed is as early after Christmas as the weather will permit. When sown in beds, prepared as above directed, which should be done as soon as possible after they are burned, instead of raking in the seed, the beds should either be patted with boards or gently trodden with naked feet. This being done, the next care is the covering them warmly with cedar or pine brush to defend the young plants from the frost.

"After all his trouble and care, the planter's hopes are often blasted by a little fly, which frequently destroys the plants when they first come up, and very often when they are grown to a moderate size. No certain remedy against them has, as yet, been discovered. I have heard, indeed, that sulphur will destroy them; and I believe it will; but it must be often repeated, and will be too expensive. I have thought, although I never have tried it, that a pretty strong infusion of sassafras-root bark sprinkled frequently over the beds would destroy those insects; and I judge so, because I have experienced its effects upon the lice, a kind of fly that infests cabbages. Drought will also destroy your plants, even where they are large in the beds; the planter should, therefore, before the drought has continued too long, water his plants night and morning until he has a good rain. You will see, then, from these enemies to plants, the necessity of having several beds differently situated, some convenient to water in swamps, and some on high ground well exposed. Those plants, at a proper size, as opportunity offers, are to be transplanted into hills at three feet distance.

"Here it may be necessary to give some directions as to preparing the ground to receive the plants, and to inform you what kind of soil is best adapted to tobacco. The same kind of land, I think, that is proper for wheat is so for tobacco, neither of them delighting in a sandy soil. I do not think a clayey stiff soil will suit tobacco; however, let the soil be stiff or light, it ought to be made very rich, by cow-penning it on the sward, or by spreading your farm-yard manure over it. I would recommend that the hills should be made in the autumn, and at about the distance of three feet or three and a half in the row and step; by this means it has a larger surface exposed to the frost, which will assist in the pulverizing and fertilizing it. A good hand may very well tend from ten to twelve thousand hills of fresh light land, or from six to ten thousand of stiff land; and I believe where the planter depends upon manuring his land for a crop he will find it difficult to get even five thousand hills properly manured.

"If the planter has time to turn over, in the month of February, the hills which were made in the fall, he will find his advantage in it; but I scarce believe that time will be found.

"If the tobacco seed has been sown early, in good beds, and those beds properly attended to, you may expect to plant your hills from them in May. The earlier your tobacco is planted the better, as it will not be fit to cut in less than three months. By planting early your tobacco will be housed in August, a month by far the best in the whole year to cut it, as it then cures of a fine bright nutmeg color, and will have a much better scent than later tobacco When you perceive your plants large enough to set out, you must prepare your tobacco hills by re-working them, breaking the clods very fine, and then cutting off the top of the hill, so as to have it broad and low; you then clap your hoe upon the top of it, which breaks the small clods.

"Having turned as many hills as you think you can plant with convenience at one time, you are to wait until a rain comes, ever so little of which, at this season of the year, will be sufficient, provided you can draw your plants from the beds without breaking. The plants will more readily extend their roots if set out after a moderate rain than if planted in a very wet season. Remember that you never prepare more hills than you can plant the next season; as fresh-turned hills are best for the plants. In this manner you are to proceed until the whole of your crop is planted. You may continue to plant every season until the last of June; but I think you have very little chance of making good tobacco if you have not your whole quantity planted by that time. After your crop is pitched or planted, in the manner directed, it will require your closest attention. Your tobacco has at this period a very dangerous enemy in a small worm called the ground-worm, which rises from the ground, and makes great havoc among the young and tender plants by cutting off and eating the leaves quite into the hill. It sometimes happens that you will have your crop to re-plant five or six times before you can get it to stand well. You are then to watch the first rising of the worm, and every morning your whole force is to be employed in searching round each plant and destroying this worm. When your tobacco begins to grow you must carefully cut down the hills shelving from the plants, and take every weed and spire of grass from around the plants, without disturbing the roots. They will, after this weeding, if the weather be seasonable, grow rapidly. When they have spread over the hills pretty well, and a little before they are fit to top, about four of the under leaves are to be taken off. This we call priming, and then the tobacco must have a hill given to it.

"As soon as it can be topped to ten leaves it must be done, and this by a careful hand well used to the business. He is to suffer his thumb nails to grow to a considerable length, that he may take out the small bud from the top without bruising, leaving ten leaves behind, in the first and second topping, or until it grows too late for the plant to support so many leaves; then to fall to eight, and even to six; but this the skillful topper will be the best judge of, as it can be only known from experience. You are now to be attacked by another enemy as dangerous and destructive as any; it is the horn-worm, of a green color, which grows to a large size, and if suffered to stay on the plant, will destroy the whole. The first glut of them, as the planters call it, will be when the tobacco is in the state above mentioned; and your hands must be almost constantly employed in pulling them off and preventing their increase; but if you have a flock of young turkeys to turn into the field they will effectually destroy these worms. You are again to hill up your tobacco and lighten the ground between the hills, that the roots of the tobacco may extend themselves with ease. Immediately after topping, your tobacco begins to throw out suckers between the leaves where they join the stalk; these should be carefully taken off, for if they are suffered to grow they greatly exhaust the plant. Not long after the first glut of worms comes a second, in greater quantities than the former, and must be treated in the same manner.

"Tobacco thus managed will begin to ripen in the month of August, when it is to be cut, as it ripens, in order to be housed; but you should have a very skillful set of cutters, who know well when tobacco is ripe, for if it be cut before it is full ripe it will never cure of a good color, and will rot in the hogshead after it is prized. The tobacco, when ripe, changes its color and looks greyish; the leaf feels thick, and if pressed between the finger and thumb will easily crack; but the experience alone can enable a person to judge when tobacco is fully ripe.

"I think the best time to cut tobacco is the afternoon, when the sun has not power to burn it, but only causes the leaves to be supple, that they may be handled without breaking. It should then remain on the ground all night; the next morning, after the dew is off, and before the sun has power to burn it, it must be picked up; but there should be no appearance of rain the preceding night, for should a heavy rain fall upon the tobacco, when lying on the ground, it will injure it greatly by filling it with grit, and perhaps bruising it. Tobacco is indeed generally cut in the morning, but in this case it must be watched very narrowly and picked up and put in small heaps on the ground before it begins to burn; for if it be scorched by the sun it is good for nothing.

"There are different methods taken in the management of tobacco, immediately after being cut, and sufficiently killed by the sun for handling. Some hang it upon fences until it is nearly half cured before they carry it to hang up in houses, built for the purpose; but this mode I do not approve of, as the leaves are too much exposed to the sun, and are apt to be injured. A much better method is to have scaffolds made close to the house you intend to cure your tobacco in; and having a sufficient number of tobacco-sticks, of about four and a half feet long and an inch thick, you bring in your tobacco from the field, and putting from ten to fourteen or fifteen plants upon a stick, you fix the sticks upon this scaffold about nine inches one from another. There the tobacco remains until the leaves turn yellow. By this method you prevent the sun from coming to the leaves, and the rays only fall on the stalks. After remaining a sufficient time you remove the sticks, with the tobacco on them, into the house, and fix them where they are to remain until the tobacco be fully cured.

"The houses built for the tobacco are from thirty to sixty feet long, and about twenty feet wide; the roof has wind beams about four feet distant to fix the sticks on, and contrived at proper spaces to receive the whole of the tobacco, until the house is full, so that there be a space of six inches between the tails of the upper plants and heads of the lower for the air to pass through.

"If a person has house-room enough, I would advise that the tobacco should have no sun, but be carried into the house immediately after it is killed, and there hung upon the sticks. But, in this case, the plants should be very few on the sticks, and the sticks at a greater distance from each other, for tobacco is very apt to be injured in the house if hung too close in a green state. If a crop could be cured in this way, without sun, its color would be more bright and the flavor finer, the whole juices being preserved unexhaled by the sun.

"When your tobacco is fully cured in the house, which may be known by the color of the leaf and the dryness of the stem, it may be then stripped from the stalk, when it is in a proper state; that is, in a season which moistens it so as it can be handled. As soon as the tobacco is so pliant that it can be handled without breaking the leaves, it is to be struck from the sticks, put in bulk until it is stripped from the stalk, which, in the earlier part of the year, should be immediately done, lest the stalks, which are green, should injure the leaf. If the tobacco is too high in case when it is struck it will be apt to rot when it gets into a sweat. One thing should be particularly attended to, and that is, it should be struck as it first comes into case, for if it hangs until it is too high or moist, and you should wait until the moisture dries away to the state I advise it to be in when you strike it, it will most certainly, when in bulk, return to its full state of moisture; and, therefore, it should hang until it is perfectly dry; and you are to wait till another season arrives to put it in proper case.

"The next thing to be done after the tobacco is struck, as I have said, is to strip it; and here you are to be particularly attentive. All the indifferent leaves are first to be pulled from the stalk by sorters well acquainted with the business, and tied by themselves, to be afterwards stemmed. The plant, with the fine leaves, is to be thrown to the strippers. They are to strip off the leaves, and tie up five leaves in a bundle, with one of equal goodness. When you have got enough for a hogshead—which I advise not to be more than a thousand weight—it should be immediately packed up with very great care, and prized. Your hogsheads should be made of staves not exceeding forty eight inches long; and the head ought not to be more than from thirty to thirty-two inches in diameter. No directions can be given here for the packing; it can only be learned from practice. If more tobacco than I here recommend be prized into a hogshead, it will be apt to be bruised, a circumstance which should be carefully avoided.

"I am, with great respect,

"RICHARD PARKER.

"*To the President of the Philadelphia Agricultural Society.*

"LAWFIELD, VIRGINIA, May 29th, 1788.

"Published by order of the Philadelphia Society for Promoting Agriculture. "S. P. GRIFFITTS, *Sec'y.*"

In Kentucky there are not less than five distinctly marked classes of tobacco, besides the various qualities known as "nondescripts."

The First Class—The rich, heavy, long shipping leaf, known to the trade as "Hopkinsville Shippers" or "Clarksville Shippers," is grown almost exclusively on the cavernous limestone soils of Southern Kentucky and North Tennessee. This is the heaviest, richest, most gummy, and fullest of narcotine of any tobacco known. The best family of the weed for this class is the Blue and Yellow Pryor. The "Big Frederick" and "Morrow" grow larger than the Pryor, but are not so rich and waxy.

The Second Class—Known to the trade as the "Red and Yellow Banks (Owensboro and Henderson) Stemming Leaf," is grown mostly upon the Carboniferous or coal-bearing soils, both in the eastern and western parts of the State. This tobacco is very large, colory, and leafy, but has not the same amount of gum or narcotine that we find in the "Hopkinsville Shippers." It is particularly adapted for making strips suitable for the English markets

The Third Class—Fine colory wrappers and fillers are grown principally upon the "free-stone lands," and in the "Kentucky Purchase," west of the Tennessee, and for years have given tone to the Paducah market It is also extensively grown upon the lands underlaid by the Chester Group of rocks in Hart, Hardin, Grayson, and other counties, and is known to the trade at Louisville as "Bacon Creek Wrappers and Fillers." The best family for this class is the "Oronoco," the same that has become so famous in Virginia and North Carolina.

The Fourth Class—Known to the trade as "Fine Cutting Tobacco," is grown mostly on the Upper and Lower Silurian formations, such as outcrop in Owen, Scott, Henry, Boone, Franklin, Oldham, and the adjacent counties. This class is very light in weight, bright in color, and deficient in narcotine. It is ranked above all other tobaccoes in the United States for "cutting." The "White Stem" is the best family for this class.

The Fifth Class is the Mason county, somewhat like the fourth class, but having more body, more gum, and more narcotine—answers well for cigars, and makes fair cutting and good manufacturing leaf. The best family for this class is the Burleigh (from which came the "White Stem"). The Oronoco also suits well this class.

In the cultivation of tobacco, three important items must never be overlooked, viz: good seed, good land, and plenty of plants. Good seed can be always had by care in selecting for seed-bearers those plants that attain the highest perfection. It is also well, every few years, to change seed, that is, to get some of the best families or varieties adapted to our Kentucky soils from Virginia or North Carolina, or from distant sections of our own State. Plants can always be secured in ample numbers if *the plant beds are burnt in November or December.* The seed may be sown then or the first warm spell after Christmas, the earlier always the better. Beds burnt and sown in November or December will usually, if re sown about the first of March, "draw" double the number of plants that the same bed will if sown in February or March. To have rich, good lands for tobacco, it is necessary to get good new ground, or else to highly fertilize poorer lands with stable manures, which is a perfect fertilizer for this plant, or with a compost of chemical fertilizers that contain in proper proportion the plant-food needed by tobacco. In order to give an idea of the importance of each element necessary for the production of this plant, I will give a table of its constituents as found by a chemical analysis of its ashes. One thousand pounds of tobacco, including leaves, stems, and stalks, will draw from the earth:

Potash (mineral)	69¼	pounds.
Lime (mineral)	68	"
Nitrogen (organic)	34	"
Magnesia (mineral)	8¾	"
Sulphuric acid (mineral)	8½	"
Phosphoric acid (mineral)	8	"
Soda (mineral)	7	"
Soluble silica (mineral)	6	"
Chlorine (mineral)	1½	"

Now if these elements are fed to one acre of land (be it ever so poor) in a *soluble form,* the rootlets of the tobacco plant will, when transplanted on this land, find them, and appropriate them to the use of the plant, so that one thousand pounds of good leaf will be produced.

Compost for Tobacco.—Dr. Albert R. Ledoux, analytical chemist to the Department of Agriculture, University of North Carolina, furnishes the following *formula* for a compost or fertilizer for tobacco:

Stable manure, mold, &c.	1,000	pounds.
Sulphate of potash	300	"
Sulphate of ammonia	100	"
Sulphate of magnesia	100	"
Dissolved bone	400	"
Land plaster	100	"
	2,000	"

Muriate of potash is often used instead of sulphate, but produces a poorer quality of smoking tobacco.

Where chemicals are not to be obtained, good stable manure, or a high grade commercial fertilizer, may be used, with a plentiful addition of hard-wood ashes.

In regard to the amount to be used per acre, no general rule can be given; it should vary, with the condition of the soil, from four to five hundred pounds per acre, or even more.

Of late years much attention has been given by the farmers of North Carolina, Virginia, and Kentucky to the production of FINE YELLOW TOBACCO; and as this industry is destined to become more popular and profitable hereafter in our State, I will here copy an excellent article (which has been kindly sent me) from the able pen of Major Robert L. Ragland, of Hyco, Halifax county, Virginia, in which he elaborately gives every process by which the finest *yellow tobacco* is grown and prepared for market. He says:

"THE CULTIVATION AND CURING OF FINE YELLOW AND SHIPPING TOBACCO.

"The first work in preparing for a crop is to burn and sow in good time a sufficiency of plant-land in good, warm situations for early plants. Plats in the forest, sloping south or southeast, are the best. In the latitude of Virginia seed should be sown from the 1st of January to the 10th of March—the sooner the better.

"Commercial manures, as they contain no grass seeds, are better for plants than manures produced on the farm.

"Make the plant-bed thoroughly fine by repeated chopping and raking; and then mix the tobacco seed, using two tablespoonfuls in from twenty-five to thirty pounds of fertilizer to every one hundred square yards in the bed, and sow the mixture on the surface. Then whip the surface with brush, or rake over lightly. (Tobacco seed—the smallest of all farm seed—require but light covering; if covered too deep they never germinate.) Then cover over the bed with fine brush or straw, to protect the young plants from frost and to keep the bed moist.

"In hot-bed or cold frame, tobacco plants may be grown large enough to plant out in from forty to fifty days. Sometimes it is necessary to force the plants in growth, so that they may be large enough to transplant at the proper time. A quick, reliable fertilizer is best for that purpose; and as it is important that the planter make no mistake in his selection, I recommend the Anchor Brand Tobacco Fertilizer as a top-dressing, with caution to the planter not to apply it when the plants are wet with rain or dew.

"To prevent depredation by the fly or flea-bug, use ground plaster in which rags that have been saturated with kerosene oil have lain for some hours, and cover the plants with the plaster thus prepared, and repeat after every rain.

"The varieties known as Yellow Oronoko and Silky Pryor are the kinds best adapted to producing the finest grades of tobacco. These varieties have been under improvement for more than forty years by *continuous selection*—saving seed from the crown-shoots only of plants having the finest fibre and texture, and that ripened yellow on the hill.

"Grey, friable soils, fresh from the forests, or long out of cultivation, with dry, porous subsoil, are best adapted to the growth and maturity of yellow tobacco.

"Eleven years' experience in the use of the Anchor Brand Tobacco Fertilizer has convinced the writer that it is the planter's best aid in the production of *rich, silky, bright yellow tobacco.* Lands capable of producing yellow tobacco need just such help as is furnished by this fertilizer in hastening the growth and giving size, substance, and early maturity to the plant. From one hundred to three hundred pounds per acre of the fertilizer may be profitably used. Apply in the drill, except on new ground, where this mode is inapplicable and broadcasting is best.

"Plant in hills, instead of beds, as early after the 10th of May as plants and seasons will admit. Commence cultivation as soon as the plants begin to spread over the hills, whether grassy or not, and continue to stir the land with ploughs and hoes till the tobacco begins to come in top, using short swingletrees, as the plants increase in size, to prevent breaking and bruising. When the plants are too large to admit the plough, use only hoes to keep down the grass and weeds.

"Wait till a considerable number of plants begin to button for seed before you commence to top, then these will ripen about the same time.

"Topping must be done according to the appearance and promise of each plant, strength of soil, and time the work is done. First-topping for medium tobacco should be from ten to twelve leaves, rarely more priming of lower leaves, neither too high nor too low, but just high enough, so that when the plant ripens the lower leaves may be well off the ground. Continue topping as the plants are large enough, observing, as the season advances, to top lower and lower, so as to bring in the late plants before frost.

"The plough should not be used later than the first day of August, as ploughing late keeps the tobacco green too long, and may cause it to ripen of a green color. The hoe should be relied on after that time to clean the crop.

"After the tobacco begins to grain—that is, to ripen—neither plough nor hoe should be used, as it has been found best to sacrifice pounds to color.

"The plants, after being topped, should be kept clear of worms, or, better still, kill the tobacco-fly with cobalt in the flowers of the *Jamestown weed;** and the suckers should be pulled off before they grow too long. Mind, do not be in a hurry to cut your tobacco before *fully ripe*, and enough fully and uniformly ripe to fill a barn. Have your barns close (log ones are best), well daubed, and dry.

"Cut the tobacco of uniform size, color, and quality, putting about seven medium plants to an ordinary four and a half foot stick. Let the plants go from the cutter's hands over the stick in the hands of holder, who will serve two cutters.

"When the stick is filled, it should go directly, without touching the ground, on a wagon, to be carried, when loaded (not too heavily), to the barn. It will take from seven hundred to eight hundred sticks of tobacco to fill a barn twenty feet square, with five rooms, and four firing tiers below joists, placing the sticks about ten inches apart, the proper distance for medium tobacco.

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* Dissolve an ounce of the cobalt of the shops in a pint and a half of water, and mix it with molasses or other syrup; bottle it, and drop it through a quill into the heart of the blossom. It should be done about sundown, and the poisoned flowers pulled off next day, otherwise the plant will be destroyed. It has been found that this weed so treated, planted around the edge of the tobacco lot, and here and there through the patch, will prevent, to a great extent, the ravages of the tobacco worm. All the planters, however, in one neighborhood must act together, and this can be arranged through the local agricultural club.

"There are two modes for curing yellow tobacco, one with charcoal and the other with flues. The first is the primitive mode, and is gradually giving place to the latter, which is cheaper and more efficient, and is being adopted by most of our best planters.

"The chief agent in either mode is heat—a dry, curing heat—to expel the sap from the leaves of the plants, and to catch the color, *yellow*, next to nature's color, green, and to *fix* it indelibly. This is the *science* of curing yellow tobacco. There are seven prismatic colors—that of tobacco occupying the middle of the prism. By the process of nature, leaves in drying descend in color from green, first to yellow, then orange, then red, and, finally, lose all color as they go to decay. Now, a quick, dry heat, so regulated as to dry out the leaf and catch the yellow color, and fix it, is best adapted to the *modus operandi* of curing fancy tobacco.

"Charcoal produces an open dry heat, well suited for the purpose, but its preparation is costly, its use tedious and laborious, and it deposits a black dust on the leaf that is objectionable.

"With flues, which may be constructed of stone or brick, and covered with sheet iron, or patent ones with furnace and pipes, the wood is burned as cut from the forest, and the whole process of curing is less costly and less laborious, and tobacco cured therewith free from dust, and possesses a sweeter flavor. Flues are equally well adapted for curing Mahogany wrappers, and for facilitating and finishing sun-cured fillers. The flue process possesses so many advantages over all other modes of curing tobacco, is so safe and free from smoke, and when its merits become better known it will come into general use and supersede all other modes.

"The first step in curing is called the *steaming* or *yellowing* process. Medium tobacco will require from thirty to thirty-six hours steaming at about ninety degrees Fahrenheit, to yellow sufficiently; but tobacco, with more or less sap, larger or smaller, may require longer or shorter time to yellow. Here the judgment of the curer must be his guide. Inexperienced planters would do well to procure the services of an experienced curer if they have tobacco suitable for coal-curing. The planter saves in the enhanced value of his crop many times the money paid to the curer, and, besides, by close observation, he may learn in one season to cure well himself. Theory alone, however good, and directions, however minute, will not do here, but it is *practice* that must qualify one to cure well. The next step in curing yellow tobacco is called *fixing the color.* When the tobacco is sufficiently yellowed, at ninety degrees Fahrenheit, the best leaves of a uniform yellow, and the greener ones of a light pea-green color, it is time to advance the heat gradually but cautiously. Keep the heat from ninety to ninety-five degrees Fahrenheit, say for about one hour, then run up from ninety-five degrees to one hundred degrees, keeping the heat between those figures for about *two hours*, observing not to sweat the tobacco, which may be easily done at this stage. Should the tobacco at this or any other future stage get into a sweat, which is indicated by the leaf becoming damp and limber, as though partially scalded, throw open door, and let it remain open until the leaf dries.

"The thermometer may fall even *ten degrees* here without injury to the color. It is advisable, however, that the tobacco be kept free from sweating, if possible. Next advance the heat, running from one hundred to one hundred and five for about *two hours.* When at one hundred and five degrees, you have arrived at the most critical point in the difficult process of curing bright tobacco. The condition and appearance of the tobacco must be the curer's guide. No one can successfully cure tobacco till he can distinguish the effects of too much or too little heat at this important stage. I will try to explain what is very plain to every experienced curer, but unknown to the beginner:

"Too little heat in fixing color operates to stain the *face* side of the leaf of a dull, Spanish-brown color, and is called *sponging*, and may be known to the novice by its effects being visible only on the *face side;* too much heat reddens the leaf, first in spots, visible on the edge of the leaf, redder than the former and visible on *both sides* of the leaf. Now, to prevent sponging on the one hand and spotting on the other is the aim of the experienced curer. Therefore, no definite time can be laid down to run one hundred and five to one hundred and ten degrees. Sometimes one hour is sufficient, sometimes three is fast enough.

"The same may be said in running from one hundred and ten degrees to one hundred and twenty degrees. While it is usual to advance in this stage about five degrees every two hours for medium tobacco, the condition of the tobacco often indicates to the practiced eye the necessity for slower or faster movements. Remember not to advance over one hundred and ten degrees till the tails begin to curl up slightly at the ends.

"Arrived at one hundred and twenty degrees, this is the *curing* process. The heat should remain at or near one huudred and twenty degrees till the leaf is cured, which takes from four to eight hours, according to circumstances. When the leaf appears cured, advance five degrees every hour up to one hundred and seventy degrees, and here remain till stalk and stem are cured.

"To run above one hundred and eighty degrees is to endanger scorching the tobacco, and perhaps burning both barn and tobacco.

"*To Recapitulate:—1st. Steaming or Yellowing Process.*—Ninety degrees from thirty to thirty-six hours.

2d. Fixing the Color.—Ninety to ninety-five degrees, for one to two hours; ninety-five to one hundred degrees, two hours; one hundred to one hundred and five degrees, two hours; one hundred and five to one hundred and ten degrees, one to three hours; one hundred and ten to one hundred and fifteen degrees, two hours; one hundred and fifteen to one hundred and twenty degrees, two hours.

"*3d. Curing of Leaf.*—One hundred and twenty degrees, four to eight hours.

"*4th. Curing Stalk and Stem.*—One hundred and twenty to one hundred and seventy degrees, five degrees per hour, and continue at one hundred and seventy degrees till stalk and stem are thoroughly cured.

"After curing, as soon as the tobacco is sufficiently soft to move, it should be run up in the roof of the barn, and crowded close. If warm, rainy, or damp seasons occur soon after, dry out the tobacco with fires, remembering to commence with small fires, as when curing, and gradually raise them till the tobacco is well dried. It is important to attend strictly to this, for if your tobacco is cured yellow it will not remain so if, soon after curing, it is suffered to get in too 'high order;' that is, absorb too much moisture. When ready to strip, it should be assorted well, the several grades put together, making about three grades of leaf and two of lugs. Tie in neat bundles five or six leaves of '*leaf*' and eight to ten of '*lugs.*' Place twenty-five bundles on the stick, and strike down as soon as stripped, unless in too high order.

"But it is not safe to permit tobacco thus struck down in winter order to remain down longer than the first of June. Watch it closely to preserve from injury. It is better to market in winter order than to hang up in the barn to dry out and be 're-ordered,' for tobacco once bulked down, and then hung up in a barn again, loses that sweet mellow flavor so desirable, and never regains it when prized.

"Pack neatly in tierces (half-hogsheads making the best and most economical), to weigh from four hundred to five hundred pounds net. Take care that the tobacco be not pressed so as to stick together, or be bruised, and let each tierce be filled with tobacco uniform in color, length, and quality. If your tobacco is fine, sound, and nicely handled, you will have the satisfaction of getting at the least a remunerating price for it, although poor and nondescript stock may be selling for less than the cost of production. The world is now full of low grades of tobacco. We must plant less surface, manure heavier, and cultivate and manage better if we would get better prices.

"There are other classes of tobacco grown in Virginia, produced on different soils and by different management—Sun-cured, Sweet Fillers, and 'Shipping.'

"*Sweet Fillers.*—To produce in perfection this class of tobacco, a mellow upland soil is indispensable. The same general rules for preparation for this class should be made as for Brights, except that richer soil or more manure is necessary to secure a full crop of fine quality.

"What constitutes the main difference in the production of Brights and Sweet Fillers is the different mode of curing. * * * *

"Nothing economizes labor so much at this stage of the crop as to have an abundance of scaffold-room ready made, and an abundance, also, of well-ventilated house-room. For sun-curing tobacco the house should be set east and west, and made any length you wish. The scaffold should be on the south side, and adjoining the house, so that the tobacco while curing, and when necessary to do so, can be readily transferred from one to the other.

"As uniformity of size, color, and kind has always been desirable, and now more recently urged by the buyers, sellers, and inspectors of the Richmond market, I would advise field-sorting and picking while cutting. I have partially adopted this plan for several years, and found that it facilitates and lessens the labor of sorting while stripping very materially.

"In all large crops there will be found a great many rough, coarse, early-matured, and somewhat wasted plants. Let them be cut and kept to themselves. On another day, a cutting of the ripest, yellowest, smoothest, and largest plants may be made. And, again, another cutting of coarse green (in color) plants should be cut, and so on through the crop. The different cuttings should be placed on the scaffold and remembered, so as to be housed separately, up to the time of stripping.

It is extremely difficult to get the assorting done well when all kinds are cut and promiscuously thrown together.

"Successful sun-curing requires certain conditions of atmosphere and temperature. There should be a certain degree of moisture in the atmosphere, and the weather should be warm, say from sixty-five to seventy-five degrees Fahrenheit, to secure the best results. The tobacco should also be kept perfectly still while on the scaffold, and not whipped and wafted about by the winds. To prevent this, the scaffold should not be made high; and while the house should protect the north side, the other three sides of the scaffold should be protected with some rough plank provided for the purpose, and temporarily tacked up. I have seen many a scaffold of nice tobacco ruined in a day for want of this precaution. On a dry, hot, sunny day it may cure too fast, not allowing sufficient time for that rich, yellow color to establish itself, which a slower process of evaporation and dessication, with the proper temperature, produces. This may, in some measure, be corrected by closing the sticks of tobacco on the scaffold. Four or five days' sun is sufficient on the scaffold, when it may be put in a well-ventilated and well-lighted house, and by no means crowded. Light is highly essential, as well as ventilation, while the curing process is being completed. What planter has not observed how much brighter tobacco cures near the door and windows than in the centre or in a dark corner of the house. If you can so regulate it, tobacco should always be cut in a warm spell. The first four or five days after cutting, in a great measure, controls the color. If not warm then, it acquires a dingy, muddy, greenish 'set,' which no subsequent weather will remove. Hence the importance of having an early crop; for the earlier we can cut, the better curing weather we may expect.

"While cutting, piling, and transporting to the scaffold, every care and precaution should be observed to prevent bruising and breaking. If the weather be hot, care should be taken to prevent the cut plants from being burned by the sun. It is, therefore, safest to scaffold as fast as the sticks are filled by the cutters, as in housing Brights. It is best to cut early in the morning, as soon as the dew is off, or on a cloudy day. Bruising, sun-burning, frost-biting, &c., do not show readily in the green state, but when cured they come out in bold relief. After cutting and partial curing, the houses should be kept open in all good weather until the tobacco is *perfectly* cured, and then they should be closed and made as tight as possible. The crop is now saved, ready for stripping during the winter and spring. This class of tobacco is not wanted on the market, as a general thing, until May.

"*Shipping.*—Shipping tobacco may be grown either on highland or bottom, provided it is well drained, and the surface soil consists of a deep, mellow loam. Indeed, I have found that creek bottoms that are not often subject to overflow during the dry seasons, that so often prevail of late years, were much more remunerative when planted in tobacco than the hill-sides. For the same reason, red land is not adapted to the tobacco crop, though a red clay subsoil is at all times desirable in order to maintain the fertility of the soil. When hill-sides are to be cultivated in tobacco, a southern slope is, of course, to be preferred. All tobacco land should be free, if possible, from gravel or small stones, which have a tendency to cause the leaf to blister before maturity. The rotation, I observe, is a clover or grass-fallow in the fall, to be followed by tobacco, then wheat, then clover, then tobacco again; but, in order to obviate the ravages of the wire-worm, which is sometimes very troublesome on both clover and grass-fallow, I have at times tried tobacco after tobacco with decided success, though this diminishes to some extent the area for the wheat crop. I have always found the best time to break up land intended for tobacco to be as early in the fall as possible after gathering in the corn crop, as the frosts of winter are very beneficial to the soil, and very destructive to the numberless worms and insects that are thus thrown up near the surface. I have tested early and late ploughings side by side, and late in the summer, when the crop had been weeded over several times, I could detect a difference in the tilth of the soil when the cultivation had been identical in every other respect. Of course the ploughing in the first instance should be deep and thorough.

"*Manures.*—I usually haul out and broadcast uniformly over the land intended for tobacco all the farm-pen and other coarse, home-made manures that I have been able to save during the season, as early in the spring as possible after the land gets dry enough for teams to enter without poaching, and then turn these under moderately shallow with a two-horse turning-plough, and harrow over until the soil is well pulverized. I have found the early application of all coarse manures to be the best, as giving them the more time to decompose and become incorporated with the soil. About the first of May I lay the rows off, three and a half feet apart, with a one-horse turning-plough. In the furrow thus made I apply some four hundred to six hundred pounds of some standard fertilizer, then lap the dirt on this with a two-horse turning-plough, and chop and pat the lists or beds thus thrown up every three feet with hoes, in order to make a place for the plant to be set. I have found heavy application in the drill to be preferable to any other mode, as giving the best results, both in quantity and quality, during either wet or dry seasons. as from the proximity of the fertilizer to the plant its nutritive elements are more easily reached and appropriated by the roots.

"I have tried surface applications during the progress of the crop, but with little or no effect, which I attribute to the difficulty of getting it in deep enough without severing so many of the roots with the plough as to counteract the good effect of the fertilizer.

"The planting season with us on the south side of James river generally commences about May 20th, and continues till about June 20th, by which time, with proper diligence, most planters can succeed in getting a good 'stand.' As soon as the young plants show signs of growth they should receive a light working with the plough and hoe, to keep down the growth of grass and weeds, and this should be kept up at intervals until, the tobacco having well covered the land, it is no longer necessary. Tobacco should be topped just as soon as it gets large enough to break the bud out and leave the requisite number of leaves, which must be determined by the planter, taking into consideration the strength of his land, the quantity of manures, and the lateness of the season. During the month of August the horn-worms generally make their appearance, and, like the locusts of Egypt, will devour everything before them of the tobacco kind unless the planter exercises unceasing vigilance and untiring industry to destroy them. I have sometimes tried putting cobalt in the blossoms of the Jamestown weed, which the horn-blowers are very fond of sucking, but could see no diminution in the quantity of horn-worms.*

"*Cutting and Curing.*—The month of September is the usual time for cutting ripe tobacco, which requires at least three months after transplanting to attain its growth and maturity, though the length of time is often varied by soils and seasons.

"Ripe tobacco may be readily distinguished by a decided change in the color and appearance of the leaf from a uniform green to a variegated yellow, closely intermingled with the original greenish tint, and

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"* NOTE.—Observation on the point: 'No considerable benefit will result, in individual or isolated cases, from the use of cobalt Its use must be general in the neighborhood to obtain full results.'"

when the leaf has become thick enough to break easily on folding or pressing a small portion of it between the fingers. There is also a glossy or oily appearance about the leaf, caused by the presence of the gum, which is not observable in the earlier stages of the plant.

"The quantity of tobacco raised per acre depends a great deal upon the seasons. With favorable seasons, and a liberal application of fertilizers on a suitable soil, I have grown fifteen hundred pounds per acre.

"Immediately after cutting and hanging the tobacco on sticks I haul it to the barns, and place the sticks on tier poles, about six inches apart, and let it remain three or four days, until it has begun to turn yellow. I then build small fires under it with logs, lying side by side, taking care not to put one over the other, so as to prevent too much blaze. There being a large quantity of sap in a barn of green tobacco, great care should be taken not to let the fires burn large enough to get the tobacco in a 'sweat,' as this produces what is called among planters 'house-burn,' and leaves the tobacco after it is cured dry and lifeless, and of a dull reddish color. The same effect is produced on tobacco by crowding it too closely in the barn while in the green state, and letting it remain in this condition too long without proper firing.

"When the sap has pretty well dried out of the tobacco, which can be ascertained by feeling amongst it, the fires can be gradually increased until the stems and fibres of the leaf are cured also. Five to seven days are sufficient for all this.

"*Prizing, etc.*—Towards the latter part of December the tobacco ought to be struck or taken down during some damp spell of weather, when the leaves have become sufficiently pliant to handle without breaking the stems, and placed in windrows or bulks, lapping the tails and turning the stalks outward. These should be raised above ground, to prevent the tobacco from moulding at bottom, and covered over at the top with boards or tobacco sticks, and at the sides with straw, to prevent the harsh winds from drying the tobacco on the outside, until a suitable time arrives for 'stripping,' which consists in breaking the leaves from the stalks and tying them in bundles of a small size. During this operation great care should be taken to have every leaf in a bundle of the same length, color, and texture, and to tie all the bundles neatly and of the same size. After stripping the tobacco, it is carefully straightened by hand, bulked down, and then covered over with boards, and weighted down heavily with stones. If the stems will now break for six inches from the head, it is in order for being 'prized.' But if the stems will not thus break, which is generally the case, after letting it remain in bulk long enough to become well pressed together, I hang it up on small round sticks two and a half feet long and sharpened at the end, so as to be pushed through the bundle without causing the leaves to spread open, and then place these on the larger sticks on the tier-poles, so that the tobacco may be dried out by the winds.

"If a damp spell of weather should intervene before the tobacco has had time to dry, small fires may be resorted to in order to accomplish this, though there is considerable risk in this. After once being thoroughly dry the tobacco should be taken down the very first 'season,' or damp spell, when the leaf becomes sufficiently pliant to handle, leaving the stem dry enough to crack, as indicated above. Although a barn which is not too closely built is the best for curing tobacco, yet every farmer should provide himself with at least one closely weather-boarded house in which to collect his tobacco to protect it from the driving rains and drifting snows of winter. My barn for stripping and prizing is a close, framed house, but furnished with a series of perpendicular windows or shutters extending to the eaves, to be opened from the ground for purposes of ventilation and 'ordering.'

"In prizing, the bundles should be placed in the hogsheads in neat layers, across those of the preceding one, with three or four rows to the layer, according to the length of the tobacco, and pressed in until the hogshead contains 1,400 to 1,500 pounds net. Here again the same vigilance is necessary in arranging and placing in the different hogsheads all the different grades as is necessary at first in assorting and stripping, as many inferior bundles, and leaves in a bundle, may now be detected and culled out that were overlooked at first through the negligence or inattention of hands.

"To become a successful tobacco-planter it is necessary to have a large stock of energy, patience, and perseverance. For no crop requires more watchfulness, skill, and management, and none more bountifully rewards the skilled and observant tiller of the soil."

There has been a never-ending dispute "among the doctors" whether the use of tobacco is deleterious to health, which is still discussed with ability and much learning. Whatever the anti tobacco-users may think seems to have very little influence upon the destinies of the weed, since its use in smoking, chewing, and snuffing is every year on the increase.

Tobacco, in its progress around the world, probably first went from America to Spain, but in what year or by whom carried is uncertain.

From Spain it went to Portugal; and in 1560 Jean Nicot, French Embassador at Lisbon, introduced the plant into France, and from him it obtained its generic botanical name of Nicotiana. In 1586 it was carried to England by Sir Francis Drake and the returning colonists of Sir Walter Raleigh.

To Raise Revenue, some governments—as France, Austria, Spain, Italy, and Portugal—make it a monopoly, either wholly managing its manufacture and sale, or allowing individuals to import and sell under heavy imposts and restrictions. In France the manufacture employs about 15,000 persons, who produce annually about 60,000,000 pounds of manufactured articles of tobacco. The net profit realized by the State has reached as high as 178,752,541 francs per year. In Holland the first-class factories, of which the larger number are at Rotterdam and Amsterdam, are said to employ about a million of persons, the principal market for the products being Germany. Large amounts are exported from this and other countries to Great Britain, notwithstanding the article is subject to a duty of seventy-two cents per pound, and five per cent. additional, and there also gives employment to a great number of operatives. Only thirteen ports in England, three in Scotland, and ten in Ireland are allowed to receive tobacco, and it must be brought in vessels of at least one hundred and twenty tons. The casks, as they are received, are conveyed to the bonding warehouses, where every one is opened and its contents examined. The whole hogshead is removed from the tobacco, and any damaged portions of the exposed mass are cut away by a powerful instrument, and the remainder is weighed and re-packed. The duty is levied only on this portion, and the damaged is immediately burned to ashes in a furnace on the premises. The English revenue from tobacco has been as great as $27,500,000 a year. In the United States tobacco now pays about one third of the Federal internal revenue.

If these heavy and unjust restrictions upon the tobacco trade could be removed, no doubt the devotees to the use of the weed would greatly increase in number, and its cultivation be far more profitable to the farmers of our State. Under these restrictions, and the various taxes imposed under various pretenses, the trade is put into the hands of cliques and moneyed monopolists, who use their power for the oppression of the growers and consumers of this great staple. Nothing but the united action of the people can ever remove these burdens from this industry, through their just demands upon rulers and law-makers of the different nations in Europe and America.

FARM CHEMISTRY AND CROP FORMULAS.

Chemistry is the science of analysis and synthesis—the *taking apart* and *putting together* of the elements in nature. Analysis and synthesis, though commonly understood as two different methods, are in truth but the necessary parts of one. They are the relative and correlative of each other. Pure chemistry treats of the elementary constitution of substances, of the laws of their combination, and of the mutual reactions and relations therein involved. It unfolds the modes and laws of proportion in building up, as well as the processes of decay and decomposition in changing the conditions of all things material. Consequently it teaches the nature of elements, and the laws of their affinity in the formation of compounds. A chemist is a person who studies and practices the science of chemistry, which may be done in the laboratory with the aid of retorts, acids, re-agents, furnaces, and blow-pipes, or in the open fields, where the rain-water, light, electricity, sunshine, and the natural elements come to his assistance. The farmer, the gardener, the dairyman, and the orchardist are *practical chemists.* They never plough a furrow, sow a seed, plant a tree or vine, manure a foot of land, or make a pone of bread, without performing a chemical experiment. They all work by rules, which, like those of the chemist of the laboratory, come from former experiments, and are based upon the teachings of the science. The only difference between a Prof. Silliman, Prof. Henry, or Sir Humphrey Davy, and John Smith, the farmer, or William Jones, the gardener, is, that the former work in the laboratory, according to the rules or laws of *pure* theoretical chemistry, while the latter work in the fields or gardens according to the rules or laws of *practical applied chemistry*—the difference being similar to that of *pure mathematics* and *applied mathematics.* Unfortunately our farmers and gardeners are not generally *scientifically* educated men, and consequently frequently "*strike in the dark.*" If our gardeners, farmers, and orchardists were scientifically educated, so as to know the elementary constituents of the soils, on every acre of their grounds, and then know how to apply mineral fertilizers in just the proportions needed by each staple crop for food, and had practical skill in manipulating the soil (cultivating) exactly right, *two hours' labor a day* would be all sufficient for them to produce enough vegetables, fruit, grain, hay, and meat to support all the inhabitants of the land.

Our General Government, as well as the various governments of Europe, have established Bureaus of Agriculture, Experimental Stations, and chemical laboratories for the express purpose of educating the soil-tillers up to this high degree of scientific planting, while several States of the American Union, in furtherance of the same objects, have employed practical men of large farming and scientific experience to aid in this great undertaking, which, when accomplished, will revolutionize the entire labor systems of the world, and will lessen, if not entirely drive from every civilized people, penury and want.

This Report and this article is written with a view to assist in this grand scheme of education, and draw the attention of our people to the necessary work which each one must do for himself before he can receive the benefits of scientific soil-tillage.

Our Geological Reports give the general component elements of the soils in every county in the State; to these highly interesting scientific Reports, made by Dr. David Dale Owen and Prof. N. S. Shaler and their able corps of assistants, I gladly refer all farmers, gardeners, mechanics, manufacturers, and others who wish to become acquainted with the great resources of our good old Commonwealth, while I will here add, for their perusal and use, tables of the chemical constituents of the various standard crops cultivated in Kentucky, and then will give formulas of such fertilizers as may be best suited to each crop.

The *organic elements* of plants are only four, viz: *carbon*, *oxygen*, *nitrogen*, and *hydrogen*, which are derived mostly from the atmosphere; but they combine with the ten inorganic elements, viz: phosphorus, potash, soda, lime, magnesia, sulphur, chlorine, silica, iron, and manganese, in various ways, to form a multitude of substances. The ash forms but a very small part of vegetable or animal substance, and is derived exclusively from the soil. The organic (four) elements taken from the atmosphere form from 90 to 95 per cent. of all plants, and the inorganic (ten) elements taken from the soil form the other 5 to 10 per cent.

From an average analyses of grains, it has been found that wheat kernels contain about 2.3 per cent., and wheat straw and chaff about 5.4 per cent. of ash; corn kernels 1.5 per cent., and corn blades, stalk, cobs, and shuck about 5.5 per cent. of ash. Then of 100 parts of ash—

	Wheat kernels contain.	Wheat straw and chaff contain.
Phosphoric acid	48.1	4.2
Potash	30.0	11.3
Soda	9.0	3.0
Lime	2.2	5.6
Magnesia	10.9	2.6
Silica	0.1	68.4
Chlorine	0.5	2.8
Sulphur	0.1	1.4
Iron		0.9
Manganese	trace.	trace.

	Corn (maize) kernels contain.	Cornstalks, &c., contain.
Phosphoric acid	53.7	8.3
Potash	28.4	36.3
Soda	1.7	1.25
Lime	0.6	10.8
Magnesia	13.6	5.7
Silica	1.6	28.8
Chlorine	trace.	trace.
Sulphur	trace.	5.2
Iron	0.5	2.4
Manganese	trace.	trace

In 1,000 parts of *red clover*, well dried, there will be found 75 parts of mineral constituents, as follows:

Lime	37.1	Chlorine	4.8
Potash	26.7	Silica	4.8
Soda	7.1	Magnesia	4.6
Phosphoric acid	8.8	Iron (peroxide)	0.2
Sulphuric acid	6.0		

In 100 pounds of ashes of tobacco, according to the analyses of the German, Merz, are contained:

Potash	26.96	Sulphuric acid	2.78
Soda	2.76	Silica	4.51
Lime	39.53	Iron (phosphate)	4.20
Magnesia	9.61	Chloride of sodium	9.65

In 100 pounds of hemp (whole plant) ashes are contained, according to analysis by G. Reich:

Potash	15.82	Magnesia	7.67
Soda	3.40	Hydrochloric acid	3.40
Lime	35.55	Carbonic acid	8.38
Iron oxide	1.08	Silica	7.70
Sulphuric acid	2.76	Phosphoric acid	14.24

In 100 pounds of buckwheat ashes are contained:

Lime	33.43	Phosphoric acid	16.82
Magnesia	10.51	Sulphuric acid	1.37
Potash	32.90	Chlorine	0.43
Soda	1.26	Silica	3.25

Tobacco contains the largest quantity of nitrogen in its composition known in any of our crop plants. In the ash of thirty samples of *dried leaf tobacco*, taken nearly equally from the different soil formations in Kentucky, 15.86 pounds of mineral elements were found, as follows. (See Appendix, volume IV of Owen's Geological Survey, page 309.) Proportions are:

Potash	4.29	Chlorine	0.43
Soda	0 29	Iron and manganese (oxide)	0.05
Silica	0.31	Phosphoric acid	0.58
Lime	4.03	Sulphuric acid	0.48
Magnesia	1.08	Carbonic acid and loss	4.36

	Sugar beet.	Common beet.
Potash	48.9	39.1
Soda	1.6	34.2
Lime	8.8	3.1
Magnesia	5.5	3.2
Chlorine	6.5	18.5
Sulphur	2.0	3.8
Phosphorus	7.6	3.5
Silica	13.1	3.6
Iron	trace.	trace.

The one a potash plant, and the other a soda plant.

	Russet apples.	Apple-tree wood.
Phosphoric acid	13.0	5.0
Sulphuric acid	7.0	3.7
Potash	38.0	19.5
Soda	25.0	1.5
Lime	5.0	63.0
Iron	1.5	1.8
Magnesia	2.8	5.5

Now a close examination of the foregoing analyses show us that the soil, to produce first-class crops of any kind, must contain the plant-food necessary for that crop, which must be applied in such manner that the rootlets of the plant can take it, and carry it into the tissues of the plant, there to be assimilated and converted into woody fibres, leaves, roots, seeds, &c., &c. A thoughful mind will at once perceive that the *best manure*, for any kind of vegetation, is a compound containing the same specific elements as the plant itself, and compounded in the same proportions as are shown in analysis of the ashes of such plant. But this compound may be much cheapened in its application, if we will also take into consideration those mineral elements existing abundantly in the soil, and proportioning the compound accordingly.

I will here refer to the tables given in this Report, under the head of "Fertilization of Lands," and will add the following table in regard to our three leading crops—wheat, corn, and tobacco:

Mineral Ingredients Removed From an Acre of Ground.

	In a wheat crop of 20 bush.	In a corn crop of 50 bush.	In a tobacco crop of 1,000 lbs. and stalks.
Potash	5.45 lbs.	8.06 lbs.	69.73 lbs.
Soda	0.13 lbs.	6.22 lbs.	6.80 lbs.
Lime	1.63 lbs.	0.22 lbs.	68.00 lbs.
Magnesia	2.43 lbs.	3.61 lbs.	8.67 lbs.
Phosphoric acid	9.12 lbs.	11.85 lbs.	8 13 lbs.
Sulphuric acid	0.98 lbs.	not est.	8.40 lbs.
Chlorine	0.35 lbs.	not est.	1.06 lbs.
Soluble silica	0.41 lbs.	0.71 lbs.	5.86 lbs.

Now let us turn our attention to the elements to be found in some of our best fertilizers. We will first review stable manure. Dr. Nichols, one of our best American agricultural chemists, furnishes us with an analysis of ordinary "barn manure," which he considers a fair representative of the article as furnished by farmers. Seven thousand two hundred and eighty grains were used in the analysis, and gave:

Water	5000	Potash and soda	41
Sulphuric acid	11	Combustible carbon matter	500
Lime	43	Chlorine	14
Nitrogen	20	Magnesia	14
Silica and sand	335	Phosphoric acid	15
Iron and alumina	22		

At the experiment farm at Vincennes, France, Prof. Geo. Ville has experimented most extensively and closely with all kinds of fertilizers. I will give his analyses of *stable manures.* Experiments with *three samples* show as follows:

ELEMENTS REQIRED BY PLANTS FOR FOOD.

These three elements being supplied by the air, are not needed in the soil:

	First experiment.	Second experiment.	Third experiment.
Organic elements—			
Carbon Hydrogen Oxygen	59.65	65.50	64.67

These five elements (four mineral and one organic) are much needed in nearly all soils:

	First experiment.	Second experiment.	Third experiment.
Organic element—			
Nitrogen	2.08	2.00	2.56
Mineral elements—			
Phosphoric acid	0.88	1.00	1.26
Potash	2.46	2.60	3.87
Lime	5.23	2.83	3.70
Soda	a trace.	0.60	0.87
	10.65	9.03	12.26

Nearly all soils have these six elements in abundance, therefore it is not necessary to apply them:

	First experiment.	Second experiment.	Third experiment.
Mineral elements—			
Sulphuric acid	a trace.	0.63	0.82
Oxide of iron	0.68	2.03	1.51
Chlorine	0.70	0.20	0.32
Magnesia	0.32	1.20	1.88
Soluble silica	1.45	20.13	6.25
Sand	25.66		10.77
	28.81	24.19	21.55
Organic elements taken from the air,	59.65	65.50	64.67
	88.46	89.69	86.22

By the above table it will be seen that an average of only 10.64 per cent. of the samples were useful to the crops, showing thereby that as a fertilizer an average of 89.36 per cent. of the samples tested were of no value.

The chemical fertilizers mostly needed by all plants are potash, phosphoric acid, and nitrogen.

Potash is found most cheaply applicable in wood ashes and high grades of German kainite.

Phosphoric acid is found in the cheapest form, which can be made readily soluble, in high grades of superphosphates, and in bones or in South Carolina "nodules," fish scraps, &c.

Nitrogen is found principally in Peruvian guano, dried blood, pulverized horns and hoofs, dried fish, sulphate of ammonia and nitrate of soda, and in green manures.

In almost any brand of standard chemical fertilizers, plant-food can be obtained more cheaply than from stable manure, yet it behooves every farmer to use all the stable or barn-yard manures he can have made; and after these are exhausted, it will pay him well to use those mineral fertilizers which a thorough knowledge of his soils and crops may show him are needed. I will here insert formulas arranged according to the elementary constituents found in ashes of the plants:

"PROF. STOCKBRIDGE'S FORMULAS.

"The following are the formulas of Prof Stockbridge for the preparation of his various special fertilizers. Column 1 gives the quantity of the crop, including the natural proportion of roots, stalks, leaves, pods, &c., to be produced in excess of the natural production of the soil. Column 2 gives the quantity of nitrogen necessary to produce this given quantity, and 3 the form in which it may be obtained; 4 of the second element, potash, and either 5 or 6 the form in which it may be obtained; 7 of the third element, phosphoric acid, and 8 the form in which it may be obtained. The formulas are based on the supposition that the sulphate of ammonia contains 24 per cent., the sulphate of potash 35 per cent., and the muriate of potash 80 per cent. dry salt, and the superphosphate 13 per cent. of soluble phosphoric acid. Of course, should the articles vary from this standard in quality, the amount used should be proportionally diminished or increased as the articles are stronger or weaker. For example, if the superphosphate used contains 18 per cent. soluble acid, divide the number in column 8 by 18 and multiply by 13:

CROP.	Nitrogen.	Sulphate of Ammonia.	Potash.	Sulphate of Potash.	Muriate of Potash.	Phosphoric Acid.	Superphosphate.
100 bushels Potatoes per acre	21	105	34	225	. .	11	85
25 " Oats (32 lbs. to bushel) per acre.	23	115	20	. .	40	12	90
50 " Indian Corn per acre.	64	320	77	. .	154	31	248
20 " Beans "	53	265	30	198	. .	20	160
25 " Buckwheat "	37	185	50	. .	100	15	105
20 " Winter Rye "	25	125	24	. .	48	16	128
25 " Wheat '	41	205	24	. .	48	20	160
2 tons Fodder Corn "	20	100	66	. .	132	16	128
100 bushels Ruta Bagas on a given area.	11	55	18	118	. .	8	63
100 " Beets " "	11	55	25	155	. .	6	50
100 " Onions " "	11	55	9	54	. .	4	32
1 ton Green Cabbage " "	9	45	15	90	.	6	48
1 " Mixed Hay per acre	36	180	31	. .	70	12	95
1 " Red Clover Hay per acre.	43	215	40	. .	80	11	85
1 " Herds-Grass Hay "	24	120	27	. .	54	10	80
2 " Rye Straw "	10	50	31	. .	62	8	64

"The mixture is purely mechanical, but the more thoroughly the ingredients are mixed the better. Apply the mixture to the surface after ploughing, and cultivate or harrow it in. If you feel a little 'ticklish' about it, strew it along the line of the furrow, and then go along and plant your crop, but never do such a thing as drop it in the hill."

I will now give six *formulas* adapted to wheat and other small grain, the materials to be mixed intimately, and sown broadcast at the time of seeding, and to be harrowed in or drilled in with the grain. The amounts here given are for one acre of land, which will increase the yield in any ordinarily seasonable year from 15 to 25 bushels per acre. A larger quantity, if used properly, will make a corresponding larger yield. These formulas, if used by being sown broadcast over the grain in February, March, or the first week in April, at the time of seeding clover, and harrowed in with a sharp-toothed harrow, will cause an increased yield from one eighth to one quarter more than if sown at seeding time.

FORMULA I.—	Finely ground bone-dust	150 pounds.
	German kainit (best muriate)	100 "
	Sulphate of ammonia	100 "
	Old pork-house salt	100 "
	Wood ashes	5 bushels.
FORMULA II.—	Superphosphates (finely ground)	100 pounds.
	Peruvian guano (best)	50 "
	Dry fish (ground fine)	150 "
	Old pork-house salt	100 "
FORMULA III.—	Dry blood or fish scraps	150 pounds.
	Rectified guano (best)	50 "
	Bone meal (fine)	100 "
	Old pork-house salt	100 "
FORMULA IV.—	Bone guano	200 pounds.
	Superphosphates	100 "
	Old salt	100 "
FORMULA V.—	Skene's (of Louisville) complete plant-food	300 pounds.
	Old pork-house salt	100 "

FORMULA VI.—Prof. Geo. Ville's complete plant-food, at the rate of from 400 to 600 pounds per acre. This is compounded as follows:

2 parts soluble bone (superphosphates).
1¼ parts land plaster (gypsum).
1 part saltpetre.
1¼ parts sulphate of ammonia.

These formulas also do well for corn and grasses, and if to any one of them are added 100 pounds of kainit (sulphate of potassa) and 100 pounds of gypsum, the compound will be an excellent fertilizer for *tobacco*. Tobacco is a great feeder on potash and nitrogenous compounds, therefore it grows well after clover, that draws nitrogen from the atmosphere. In like manner all kinds of green crops, such as peas, oats, rye, spurry, ragweeds, buckwheat, &c., if turned under in the green state before the seed are fully ripe, prove most excellent fertilizers by supplying to worn lands nitrogen and potash.

An excellent routine to follow with old worn clay lands, is to sow early in the spring oats, turn them under when generally headed, then sow immediately cow-peas, one and a half to two bushels to the acre, plough these under in September, then sow rye immediately. Seed with clover thickly in March, and either turn under the clover in August, or let it stand till the second year. In this way any good clay land can be reclaimed. If fertilizers are added, the benefits will be that much greater and more rapidly obtained. In buying chemical fertilizers, the best quality is always the cheapest.

That the reader may learn more regarding experiments with fertilizers, I will refer him to the articles on "Fertilization of Lands," and on "Plant food and Agriculture," in this Report.

With a proper knowledge of the chemical action of soils, and a rational plan of fertilization, every acre of land used by a gardener, orchardist, and farmer, may be made to produce enormous crops of every staple, so that there will rarely ever be heard the complaint (now so common) of bad seasons and short crops. Every acre of level land in Kentucky can be made to produce, year after year, an average of 1,500 pounds of tobacco or 50 bushels of wheat, or from 80 to 120 bushels of corn, and other crops in proportion; but in order to reach this result the farmer must think deeply, and *cultivate his brains as well as his soil. So mote it be.*

SUGAR MAKING IN KENTUCKY

There are many plants from which sugar and syrup or molasses can be made with profit. Chief among these are the sugar-cane, sorghum, imphee, maples and other trees, watermelons, beets, grapes, &c. The sugar-cane was introduced into the United States by the Jesuits of Louisiana about the year 1750-'1, and the first sugar manufactured from the juice of this plant was made in the Province of Louisiana about twelve to fifteen years afterwards. This plant is adapted by its nature only for tropical or semi-tropical climates; and although repeated attempts have been made to have it acclimated to favorable situations in more northern regions, no successful planting has been reached above the northern limit of Louisiana. At the present time, sugar making from "cane" in the United States is chiefly confined to Louisiana, Texas, and Florida. The sugar supply of the commercial world for the year 1876 was about 3,457,623 tons, of which amount Europe produced from the sugar beet about 40 per cent., or 1,383,049 tons. The people of the United States use about forty pounds per capita of sugar per annum, besides molasses, syrup, and other compounds of saccharine matter. The State of Louisiana produced a crop in 1876 of 190,672,570 pounds, or 169,331 hogsheads, and 12,024,108 gallons of molasses, which is an average of about seventy gallons to the hogshead of sugar. From this source, and the West Indies, comes the great bulk of the sugar and molasses used by the people of Kentucky.

Maple Sugar.—In the early settlement of this State, the people made the most of the sugar and syrup then used from the "rock maple" or "sugar maple." In 1811 Kentucky produced 2,471,647 pounds of maple sugar, and Ohio over 3,000,000 of pounds. At the same time there was produced in this State about 60,000 gallons of maple syrup. As the country has become more thickly settled, the "sugar tree groves" have been destroyed by the axe, and the low price of cane sugar has so far operated upon this industry that in 1870 only about 436,405 pounds of sugar, and 30,079 gallons of syrup, were produced from the maple. The season for making sugar from the maple is in February, when the thaws which succeed the winter freezes cause the "sap to run." Sometimes, however, when we have a very cold winter, the "sugar making season" will not begin before March. The investment for making syrup and sugar from the maple juice is not very expensive, consisting principally of wooden troughs, in which the juice is caught as it drips or runs from the tree (that has been before skillfully "tapped"), and of several large iron kettles in which the "sugar water" is boiled down to the consistency required. The fast disappearance of the "sugar tree groves" warns us that each year will lessen the production of this industry, and make us look upon maple sugar as a luxury too precious to be used for ordinary purposes by our people.

Sorghum.—The production of sugar and molasses from this plant has fluctuated very greatly since its first introduction into the United States.

For several years during and after the civil war, while sugar and molasses were of high value, sorghum became very popular among the farmers of Kentucky and throughout the Mississippi Valley, but since 1870 there has been a gradual decline in its cultivation, until now very few farmers plant more than small patches for the use of the family. In this latitude, sorghum is the most exhaustive crop ever planted on our soil. It seems to draw from the soil so many of the elements of plant-food, that no other plant will flourish where it has been grown for several years, without an extra liberal amount of manuring.

Sugar Beets.—The manufacture of sugar and syrup from beets has never been tried in Kentucky, except on a very small scale. In Europe this industry is everywhere fostered by the governments, and experience has shown that it can be made profitable throughout France and all the German States. More than half of the sugar and syrup consumed in Europe is made from beets and grapes. Experiments, carefully made in Maine, Massachusetts, New Jersey, Pennsylvania, Illinois, Indiana, Wisconsin, and California, prove that sugar and syrup can be produced from the *beet* as successfully in this country as in Europe. In each of these States are companies engaged in this employment, with promise of its proving one of the most profitable industries known to our farmers. The beet is known to grow well in Kentucky, and what we lack to make from this vegetable all the saccharine products needed by our people is enterprise and skillful management in this branch of agriculture. The time is not far distant when "sugar beets" will be ranked high in our list of staple crops. The Department of Agriculture will supply the true sugar beet seed to any farmer who desires to experiment in this line.

Watermelons for Sugar.—During the war many farmers in the Southern States made molasses and sugar from watermelons, muskmelons, and cantaloupes. In Kentucky an occasional experiment has been made in converting a surplusage of melons into syrups, with considerable success. Any vegetable which contains a large percentage of carbon or starch has within it the elements of alcohol and sugar. Many parts of Kentucky are well adapted for the production of watermelons in endless profusion, and these can be easily made into syrup or sugar at a comparative small cost. Doubtless the time will come (and that before many years pass), when a greater subdivision of labor on the farm will be requisite, and when many branches of agriculture, now neglected or entirely ignored, will prove most profitable sources of wealth. We will then find everywhere dotting our State "beet fields," melon fields, and vineyards in great luxuriance, dedicated to the production of sugar and other forms of saccharine matter or alcohol, and millions of dollars will thereby be saved to our citizens by the preparation and consumption of our own home-made productions. In speaking of the manufacture of sugar from watermelons, the statistician of the Agricultural Department at Washington says:

"The following facts respecting an enterprise in California for manufacturing sugar, alcohol, and oil from the watermelon are communicated by our correspondent at San Francisco. The islands in the delta formed by the Sacramento river on the north and the San Joaquin on the south (in Sacramento county), recently reclaimed, aggregate about 400,000 acres of alluvial deposit of marvelous fertility. The soil and climate are especially adapted to the production of watermelons in great perfection. The yield was so abundant that to find a profitable outlet for surplus crops, amounting to hundreds of tons, became to the farmers an important inquiry, and stimulated endeavors and experiments in that direction. By using only crude, primitive apparatus, they succeeded in manufacturing sugar so satisfactory in quantity and quality, that several enterprising farmers on Andros Island were inspired with faith to unite in an enterprise for obtaining the best apparatus known, and manufacturing on an extensive scale. The result is an organization incorporated under the name of the California Sugar Manufacturing Company, with a capital stock of $2,000,000, of which, at last accounts, 50,000 shares had been sold. The company are erecting, at Isleton, a factory and appurtenances, for which they have imported machinery from Germany at a cost of $10,000. The design, as reported, includes the manufacture of two or three grades of sugar from the purer juice, alcohol from a remainder in the pulp and rind, and oil for the table from the seeds. The claim that the melons will yield about ten per cent. of sugar and the seeds twenty-five per cent. of oil savors of sweetening and lubricating a little too profusely, and needs confirmation."

THE NEW PROCESS OF GRINDING WHEAT.

During the last eighty years the human mind has been exercising that free thought which was guaranteed by the results of the American and French Revolutions. With free thought in politics, in religion, in science, and in ethics, came the natural consequences of free thought in all kinds of inventions and discoveries. Within eighty years over 70,000 inventions and discoveries have been filed in the Patent Office at Washington, and nearly as many more in England, and a like number in other leading countries of Europe. It seems that when the human mind is free to think and act, that inventions and discoveries come naturally as fast as necessity demands them. With the world markets practically assured to our people for *cheap flour,* as has been exhibited within the last quarter of a century by our exports, there naturally arose a necessity for an improvement in the old process of converting wheat into flour. Under the old system the grains of wheat were *mashed* as finely as possible between buhr mill-stones, in order to get the largest amount possible of white flour by the first process of grinding, and so as to make the very least possible amount of "middlings" or "shorts." These middlings were re-ground and made into an inferior grade of flour, where the process of squeezing or mashing was carried still further, until all the vital germ cells of the berry were destroyed by *friction and heat.* Under this kind of treatment none but the very best grades of winter wheat could produce the best grades of flour.

But fortunately Minnesota, Nebraska, Iowa, Wisconsin, and other States of high latitude, produced only spring wheat of the best quality, and comparatively but an inferior kind of winter wheat. This spring wheat was hard and flinty, and could not stand the *mashing* and *heating* process of the old system, and consequently the thinking millers of that section demanded a new invention in the *modus operandi* of grinding. Minnesota has the honor of this discovery, which is now known among millers as the "NEW PROCESS." The object sought was to *disintegrate* but not to *crush* the granules of the wheat, which are as far as possible preserved unbroken. The epidermis or coating of the cellular tissues in the berry, when not broken, preserves their nitrogenous contents from the corroding influence of the air, and from the germs of microscopic vegetable fungi, which are everywhere afloat in the atmosphere. The buhrs also do not heat the cells as they did under the old system, which caused the absorption of the moisture necessary to remain with the flour, thus producing deleterious chemical changes in the body of the grain. The new process also avoids several chemical compounds that were superinduced by the old system, and became cognizable through the taste, smell, and adhesiveness of the flour. Under the new process, the flour embraces all the normal elements of the wheat berry in their natural state. By this process, spring varieties of wheat, as well as inferior grades of all kinds of wheat, can be made into the very best quality of flour, provided the life germs of the wheat are not killed by heat before it comes to the buhrs. The flour is first made into "disintegrated, uncrushed middlings," the object being to make the largest possible amount of these middlings, which are "purified" before being re-ground into flour.

This late improvement in grinding now renders it practicable to obtain more flour from the same amount of wheat, which is of a better quality, and also to use lower grades of wheat, if sound, from which flour can be made altogether more desirable and "fancy" than the best brands which formerly ruled the markets. These improved patented flour brands have gained a very high reputation, both in the Eastern cities and Europe, and make the lower grades of spring wheat, that grow so luxuriantly in the high northern regions, exceedingly desirable when ground into flour for export. This will explain why it is that much of the flour exported sells in England at prices no higher than the best qualities of wheat in the berry.

For more than sixty years a similar process of grinding has been used in Hungary and parts of Austria, known as "half high milling;" but the Hungarian system was bungling and far from perfect, although it arrived at the same results by using several intervening processes, which have been improved upon greatly by the "new process" of Minnesota. Nearly all the new mills now built in the northwest grind upon the new plan, and several of the far-seeing millers of Kentucky are adopting this process, which will, within the next decade, become universally used in the manufacture of the best grades of flour. The great wonder is that millers did not discover this "high grinding" process a century earlier.

FERTILIZATION OF LANDS.

Probably no other subject can more interest the farmer than that of the improvement of the plant-producing properties of the soil from which he gains all his sustenance and wealth. In another article I have shown how all soils are made from the *débris*, or waste of the rocks and the vegetable mould, which in past ages have accumulated and been distributed over the earth's surface. In all new and wooded countries the elements of plant-life are usually found in sufficient quantities to support all kinds of vegetation indigenous to their climates and altitudes.

When the trees are cut down, and the land cleared of all the grasses and undergrowth, for the purpose of cropping, the soil gives forth all its energy to produce in perfection such plants as may be intrusted to its fostering care by the farmer. It is a law of nature, however, that no plant grows and matures its seed, unless the inorganic elements of plant-food adapted to its construction are within reach of its roots; and also, that when these elements pass into plant-life, through the circulation or "sap" of the plant, they must thereafter be lacking to that extent in the soil. This process of detraction, if continued (without the soil is replenished from some outside source), will eventually impoverish the richest land on earth. Now the acme of scientific farming is practically to be able to cultivate lands for an endless series of years, producing each year first-class crops, without lessening the richness of the land.

In Japan and China farming is conducted on principles so in accordance with natural laws that the lands produce maximum crops every year, unless prevented by unusual droughts, and these crops average larger to the acre now than they did four thousand years ago. The older countries of Europe are beginning to copy after the ancient agricultural civilization of Japan and China, and are rapidly learning to put into practice what has been commonly done in those Eastern countries for thousands of years, viz: to restore each year to the soil the plant-producing elements taken from it by the crops.

With the American people this subject is comparatively new, and it has only been within the last score of years that any attention has been paid by our farmers to the preservation and improvement of their lands in a scientific or *natural way.* The establishment of the Department of Agriculture at Washington, and the consequent development of State Boards and State Bureaux of Agriculture, gave the first indications that our people were awakening to the fact that something must be done to prevent the continued depreciation of our lands in their food-producing capacity. From these institutions inquiries have gone abroad over the land regarding the true condition of the cropping powers of our soils, and the reports come back from every State and every county that the lands are getting poorer year by year, and that the average produce per acre of all cereals and other crops have diminished each decade since the lands were "cleared up" and passed into active cultivation.

Now the practical question for every soil-tiller to consider is, how can this continued depreciation be checked, and then how can the old and worn-out lands be restored to their virgin richness? This question is now engaging in its solution many of the best and largest brains on this continent and Europe, and the experiments made by practical and scientific agriculturists have been published to the world as fast as developments could deduce correct theories from repeated experiments, performed with the greatest care and precaution, both in the fields and in chemical laboratories. For the benefit of our Kentucky farmers, I will here collate and present the theories now considered the most trustworthy in restoring worn lands, and in giving maximum yields of the various crops adapted to our soils and climate. It is a common thing for us to say that lands which have been cropped for fifty years are "old lands," and those that have been under tillage for twice that long, in any of the States of the Union, are generally said to be sterile and worn out. At the first settlement of Kentucky, the immigrants found our soil full of an accumulated store of plant-food. The lands were then almost worthless for want of inhabitants, so that the farmer could well afford, in cropping, to "skim off the cream of the soil," and then seek new uncleared fields, which, in their turn, passed through the same ordeal. This was a cheaper system than fertilization by manures of lands that had been even partially exhausted of their primitive richness by the "new settler," who could, at that period, procure all the new lands he wanted for little more than occupancy.

But this "skimming process" (to use a hackneyed provincialism) has "played out;" and now the time has come when *lands* must be preserved and restored, otherwise they will not yield such crops as the demands of commerce and our daily bread require. Now the question, as I have before said, is, *how to do this*. Every farmer knows that if you will put enough stable manure on lands that they will, no matter how badly worn, produce full crops. Why is this? Simply because stable or barn-yard manures have all the inorganic elements in them that we usually find in our cropping plants, and are therefore "complete fertilizers." All plants require, in different proportions, *fourteen invariable elements*, four of which are termed organic, and ten inorganic or mineral, viz:

Organic elements.
Carbon,
Oxygen,
Hydrogen,
Nitrogen.

Mineral elements.
Phosphorus,
Potash,
Soda,
Lime,
Magnesia,
Sulphur,
Chlorine,
Silica,
Iron,
Manganese.

None of these elements can be taken into a plant in a solid state—*they must all be dissolved in the soil before they can be assimilated as food by any vegetable production*. This shows the great necessity of the *rain-fall*, and teaches us why the great African Sahara, and other places where rain-water seldom or never falls, are *deserts*. The organic elements can pass into a plant either in the gaseous or liquid form, as they are found supplied by nature in the air; but rain-water is always requisite to dissolve the ten mineral elements, which go to make up plant life, whenever they are thus appropriated; so that the best chemical fertilizers or barn-yard manures on earth (be they applied in ever so great quantities) will not cause a good crop to grow without rains to dissolve them, or a substitute by artificial irrigation. This important fact must not be overlooked in experimenting with fertilizers.

The *four organic* elements form nearly ninety-five per cent. of most plants, and are derived principally from the atmosphere. The *ten inorganic* elements form the other five per cent. of most plants, and are derived from the soil. The organic elements are supplied as follows: carbon in the form of carbonic acid is taken from the air, and absorbed into the plant, through the leaves and bark; the hydrogen is supplied by water, oxygen by carbonic acid and water, and nitrogen partly from the air and partly from the soil. The ten inorganic elements, which compose the five per cent. of mineral in the plants, are usually found distributed in all soils, but in very unequal proportions. Magnesia, sulphur, chlorine, silica, iron, and manganese exist in nearly all soil in sufficient quantities to supply plant life; but phosphorus, potash, lime, and soda are frequently lacking in quantity sufficient to supply certain vegetable productions. Now the great desideratum in manuring lands is to furnish to the soil in proper proportions these four mineral elements, and the amount of nitrogen which finds its way into the plant from the earth through the rootlets. The manures usually collected in the barn-yard (stable manures) possess all these elements in good proportions, because these are but the residuum of vegetable productions, which have passed through the animal organizations of different kinds of "live stock" If every farmer could get enough good stable manure, and had time and skill to properly scatter it over *all his lands*, whenever needed, then the problem of enriching worn out soils would be solved; but unfortunately no farmer has more than one tenth or one thirtieth enough of this kind of pabulum for his fields. After he has used up all the barn-yard manures, then what must be done? Every intelligent agriculturist will answer, we must look to scientific discoveries for supplies, after our home-made manures are exhausted. This is correct. The brain powers were given man for use—to think, to experiment, to invent, and well have the wise thinkers of the world worked this great gift! Let us see what some of the advanced thinkers and experimenters have discovered.

Prof. Levi Stockbridge, of the State Agricultural College of Massachusetts, one of the most profound thinkers and best experimentalists in agricultural matters now living, over a year ago, in an address before the Board of Agriculture of Connecticut (a large portion of which I will here insert, because it is pertinent), said:

"How shall we raise the standard of the fertility of our lands so that we can get pay for our work in tilling them?

"Now the first obvious answer to this is, that we must restore to the land the refuse of the crops which we carry from it, then perhaps we can continue to crop it. But here we are met with this fact—some of us are in debt; we are all rather poor; we have around us a large population engaged in other pursuits than agriculture, which make no food, and who must have their daily wants supplied from our agricultural products. Combining with these things there is a constant demand that we sell from our farms the crops which they annually produce, and therefore we have little left as the refuse of those crops (as we call barn-yard manure), to apply to our soils, to keep up their fertility, still less to increase their fertility. What is to be done? That is the condition in which we find ourselves—a poor soil, and a demand that we sell everything that we can grow upon it. How shall we enrich that land? If we can do it at all while we continue to crop it, we must lay hold of every law of nature that will aid us in the process. If there is any natural law that we can bring to our aid, we must use that law in our work. We must work according to natural law if we would succeed. Therefore, if you please, I will turn to the plant itself, and will make some inquiries respecting the law of plant growth.

"Now I am sometimes accused of saying that farmers do not know anything; but I believe this is true, that to the average farmer the plant, as it grows from the soil, and as he sees it perfectly developed—to the average farmer, I say, this plant is a profound mystery. Take it in its simplest form, as a seed, apparently dead, lifeless. He places it in the warm, moist soil, and it begins to expand; it sends out its root, which permeates the soil in all directions and at great depth; it sends up its stem, develops its leaves, and grows day by day to perfect development; but whether it is the corn plant, or the gigantic cone tree of California, it makes no difference. The question with the farmer is, whence is it and what is it, and where did this plant come from? It 'growed,' as Topsy said about herself, but what is it, and whence did it come? Is it a new creation of matter? The scientific man says 'No.' The only thing mysterious about this plant is the vital principle of life, the architect which has built the plant out of the materials that are in the soil, or in the air. Nothing new has been created. The architect or builder has simply gathered old materials from the soil and from the air, and constructed the new plant. Now there is one peculiarity about the structure. The scientist examines it as it grows, and sees it develop from day to day by the addition of cell to cell, cell to cell, and that it always continues to develop in form and structure, according to its kind. He knows that the corn plant or wheat plant will always be made in the same way, so far as its physical structure is concerned. There will be sports of nature, but that does not change the law. He knows that the tomato plant will not develop in its physical structure like the potato plant, the Indian corn plant will not develop like the wheat plant, and that this physical structure is an absolute, natural, unvarying, unchanging law. It always was, it always will be, and the farmer can rely upon it. That is the first principle.

"The next step is, when the scientist comes to examine the plant he finds that every plant is made of certain materials. Dry it and burn it, and you have left five pounds in a hundred of one kind of matter; ninety-five pounds in every hundred (about that, taking it as an average have disappeared. You have divided the plant into two classes of matter—organic—which has disappeared, and which it obtained originally from the air; inorganic, which you have left behind, called ash, and which it obtained from the soil. Now what we believe in relation to this plant composition is, that it is an absolute natural law, which always was and always will be. Every plant will be thus made. Of course, I remember that certain plants, like the tobacco plant, have a larger per cent. of ash, but on the average every plant that grows will have about 95 per cent. of organic matter, and about 5 per cent. of inorganic matter, the organic matter coming from the air, the inorganic matter from the soil. This is the natural law, immutable, unchangeable. We can always depend upon it.

"You will find, when you examine plants in detail, that every plant contains silica, potash, soda, lime, magnesia, phosphoric acid, sulphuric acid, chlorine, and iron. All our agricultural plants certainly contain these. You will never find a perfectly developed plant, in its normal condition, without these elements in it; but if you take a corn plant, or a potato plant, you will find that the *proportions* of these different elements are different. The corn plant is not made like the potato plant in its constituents. It will have the same elements, but they will be in different proportions. The builder, the vital force, in gathering the proper food to build up the structure, gathers all those materials, but it gathers them, in obedience to a certain law, in certain proportions. There will be sports of nature. You may artificially and slightly change the composition, but let a plant grow normally healthy, and it will be made in a certain way, with all these materials in certain proportions, if you have a healthy, vigorous, well developed plant. This is a law; it is not accident. The plant itself is not an accident. Its physical structure is not an accident. Its composition is not an accident. It is law that controls it, and we may depend upon it always, everywhere, under all circumstances in the future. The operation of this is going to be obeyed—must be provided for, or else the plant will not develop.

"Our next point is, that so far as the plant itself is concerned (and this is very intimately connected with the statement already made), there is no one of these elements that is any more important to the plant than any other. Every plant has organic matter in it; it has inorganic matter in it. The organic matter is of no more consequence to the plant than the inorganic matter. No plant ever was, no plant ever will be made by the vital force unless it has both. Every plant has carbon, oxygen, hydrogen, and nitrogen in it. No plant ever was, no plant ever will be made without these four elements, and one element is just as important to the plant as the other. If either of the elements is absent, your plant does not grow. So of your inorganic elements; you have in all eight or nine. No plant ever grew, and perfected itself naturally, without it had them all. One is just as important to the plant as the other. It may have only a fraction of one per cent. of soda, for instance, the vital force, the builder, may gather only a fraction of one per cent. to build the plant of, but that fraction of one per cent. is just as important to the development of the plant, to the making of a perfect plant, as any other substance, lime for instance, which we find in it at the rate of twenty, forty, or sixty per cent. If the plant cannot get its fraction of one per cent. of soda, however plenty is your lime, however plenty your potash, however plenty your phosphoric acid, it stops its growth when the soda is exhausted. So it would be with any other element. The potash, or phosphoric acid, in a soil, being exhausted, the plant stops its growth. If, however, we turn from the plant to the farmer, to the man who goes on to the field to do the practical work of providing for the wants of the plant, seeing that the vital force must have all its wants for building it up supplied, the matter is entirely changed. I say it makes no difference with the plant what element is absent, it must have them all; but to the farmer it is a very different thing, because there are certain elements which enter into plants in very small proportions, and which are found in the soil in very large proportions. Now, the skill of the farmer is shown by knowing what is in the soil in large proportions, which is required by the plant in small proportions, and knowing whether the supply in the soil is sufficient for all the purposes of the present and of the future. If it is, he need not trouble himself to supply that element. He will be under the necessity of supplying only that in which the soil is deficient; only that which the plant cannot obtain naturally. Take, if you please, the organic elements, all absolutely necessary for the plant. Carbon, of which plants in their dry state contain about forty-five per cent., the farmer need never supply. There is no use in hauling carbon to our fields to feed our plants. There is no need of piling up a great mass of carbonaceous material, which we may call compost, or barn-yard manure, or anything else, for the sake of giving your plants carbon for food, because in the soil, and in the air, there is an abundant supply for all the plants that ever have, or that ever will grow on the earth, and Nature made the plant with the capacity to gather it, so that without any aid from man the plant can gather all its carbon. There is no need, then, that you feed a plant with carbon. It will take care of itself. So with oxygen, and so with hydrogen. In the water, and in the air, with which the plant is filled, and by chemical action, the union of certain substances in the plant, carbon, oxygen, and hydrogen, the plant can always supply itself with. No farmer need ever feed his plant to promote its growth with these substances. If, however, we come to nitrogen, it has been abundantly proved by scientists, that here there is a deficiency. The plant takes large quantities of nitrogen, especially in its seed. It may gather some nitrogen naturally from the air, perhaps in the form of carbonate of ammonia, and from the soil, in the form of ammonia, taken in soil water. It can gather some, and yet the quantity of nitrogen available to the plant is insufficient to supply its wants. Now, it is the farmer's clear duty, so far as these four elements are concerned, to regard only the supply of nitrogen. Give your plants nitrogen, and you may rely upon it as a natural law that they themselves can take care of the supply of the other organic elements.

"Turning now to the inorganic elements, the same law holds good. Take soda, for instance. All our plants take soda; but, so far as the farmer is concerned, we find that, taking our New England soils—and when I say New England, I guess at Connecticut, soils. I know about Massachusetts—I say, taking New England soils, any of the soils that are made of the micaceous rocks away up this valley, you will find enough soda, enough magnesia, in those soils, to-day, and enough of the material to develop soda and magnesia, to supply all the plants probably that will ever be produced on this soil. You will find enough, probably, sulphuric acid; you will, undoubtedly, find enough silica. You need not, therefore, go to Virginia and import 'infusorial earth,' or whatever it was called, to give your plant silica. You can get it cheaper at home, and there is enough in the soil to supply all that is necessary. If, however, we come to the substance that we call potash, we shall find that the plants take large quantities, as a rule, a large proportional quantity, and that potash in the soil is very deficient. The constant cropping has exhausted the soil of potash, and the farmer must supply it. Scientists have proved this. I think the statement was made clearly by Prof. Atwater, last evening, and all scientists agree on this matter, that so far as the farmer is concerned in supplying the wants of the plant, the only substance that he need supply will be potash, phosphoric acid, and nitrogen. My own experiments seem to show that, with one or two plants, he should give them a little of something else, magnesia, and a little lime for the tobacco and for the cotton plant. Not because I can make a greater quantity of tobacco by putting in a little lime, but because I find that my smoking friends say that the ash of the end of the cigar is a little whiter, and, therefore, they prefer it when I put a little lime into the soil where I grow tobacco; but I will get my pounds with potash, phosphoric acid, and nitrogen. I want to repeat that, because I mean it. So far as the farmer is concerned, on these New England soils, you may rely upon it as a natural law, that if the farmer will supply his plants with nitrogen, with phosphoric acid, and with potash, the plant itself will take care of all the other elements, for it will obtain them in the soil and in the air. There is, and I feel inclined to say, there always will be, an abundant supply of them to meet the requirements of all the crops that the soil will ever produce. Perhaps that is putting it rather strong. I do not know how terribly we may work on the soil two thousand years hence, but it will answer through our lives. If we give the plant nitrogen, potash, and phosphoric acid, it can from this soil get its soda and its lime; it can from this air get its oxygen, its hydrogen, and its carbon. This I claim to be a natural law, on which the farmer may act, and by which he may abide in the practical details of growing crops and manuring plants; or, as I would like to put it, supplying the builder, the vital force, with the materials with which it is necessary it should be supplied to build up plant structure.

"We come, then, to this point. Scientists believe that the notion that it is necessary to manure lands with a great mass of stuff, a great bulk of muck, if you please, or coarse fodder, or any kind of massy, bulky material, is a fallacy. But this is the farmer's gospel, you know. As was said last night here, and it is true, the farmer believes that a fertilizer is good for nothing unless it has a most horribly offensive odor. You do not know that you can convert coal tar and sulphuretted hydrogen into the most offensive smells that were ever conceived of, without their having a pound of fertilizing material in them. So, too, with this coarse material. You may cover your land with certain kinds of coarse, crude material, and you will supply the least possible quantity of the material the plant wants to build up its structure. So scientists say, what they believe, and what they think they can prove beyond a peradventure, that the old idea, that you must thus feed plants with large quantities of coarse, crude, undecomposed material, is a false theory, and ought to be discarded; that you can give the vital force the materials proper to build up the plant's structure just as well in a very few pounds of material of the right kind, properly prepared and compounded, as you can by giving it a large mass of material, and that, under certain circumstances, and for certain purposes, the smaller quantity is altogether the best and most reliable.

"Now, gentlemen, I believe this to be the natural law. I believe that with one kind of material you can produce just as heavy a crop, of any kind that you will name, on your lands, with five hundred pounds, as you can with eighty-five hundred pounds of some other material, if the material is right, and success in this line will attend your efforts.

"One thing more in relation to this matter of what is wanted. Plants do not feed on soil, as soil. This the scientist will tell you, and it is common sense. Plants do not feed on soil, as soil. They do not feed on organic matter, as organic matter. Pound up a block of freestone down here, or a block of granite, which shall contain all the elements in a plant; take sawdust, as fine as you can make it, compound the two, and plant a plant in it, and it will starve to death. You have got all the elements of the plant, and yet it will starve to death. Why? Because there is no food in the compounded material. The powdered granite and sawdust contain all the elements, but they contain them in an unavailable condition. So you may plant a plant in powdered potash, in certain forms, and yet the plant may starve to death for want of potash. A plant may starve to death in the Charleston basin for want of phosphoric acid, although there is an exhaustless supply of phosphoric acid there in the form of nodules. We take those materials and manufacture them into superphosphate and get one of the very best articles to use upon our farms; yet the South Carolina plant, with its roots all through it, will starve to death for want of phosphoric acid, because it is utterly unavailable. So in order to have soils to feed plants, the material must be brought into such condition that the vital force can use it. Your potash must be made solvent. Your phosphoric acid must be made solvent. Your lime must be in such condition that the water can take it up. Every thing that feeds the plant must be changed from its compound state, as we originally find it. It must be taken to pieces. The lime must be offered to the plant in the form of lime, the potash must be offered to the plant in the form of potash, and the nitrogen must be offered to the plant in the form of nitrogen or ammonia, and then, and only then, can the vital force of the plant take up the appropriate material. This is a natural law, and, I believe, an unchanging law. The farmer may rely upon it; and if he can, he knows he cannot rely upon raw, coarse material to feed his plants until that coarse, raw material has, by certain natural processes, been all taken to pieces and separated. Then the plant gets the small quantity of phosphoric acid, potash, &c., necessary to feed and build it up. This is, I believe, a natural law.

"Now, I have passed over the leading points in this matter of plant nutrition and special fertilization, and, before proceeding further, I want to call your attention again to special fertilization. I say the vital force builds the plant up with certain materials, and the best material is that which contains the elements in the right proportions. Plants are special feeders. One wants a large quantity of nitrogen, another a small quantity. One wants a large quantity of phosphoric acid, another comparatively a small quantity. One wants a large quantity of potash, another a comparatively small quantity. Now, then, when that fellow went round here in Middletown, and told one man that that fertilizer which he called 'infusorial earth,' was just the thing for carrots, and then went to the next man and told him it was just the thing for tobacco, he lied one way or the other. If he told A, 'this is just the thing for wheat,' and told B, 'this is just the thing for potatoes,' he lied to one or the other, because a fertilizer which is the best thing for wheat cannot be the best thing for tobacco or for potatoes. The vital force which builds them, builds with those materials in different proportions, and if he supplied the materials to make the wheat-plant, and then supplied the same materials for potatoes, there would be a great waste somewhere. Mind you, I do not say that the compound for wheat would not feed the potatoes, but he has got the things there in proportions which he does not need. He is throwing his money away for the present crop, so that it is a natural law that the best material to make a plant, the best food to make a plant, the best compound to make a plant, is that which is formed according to the composition of the plant, and that is a matter of economy. It must be so; and, it being a natural law, that farmer is acting in the line of his own interest, who, knowing the wants of a plant, knowing the materials to be used, shall apply those materials for supplying crops which are specially adapted to or required for the building up of that crop. And this I believe to be a natural law.

"Now, then, I have passed fully over this ground without going into all the details, and I come to say a word in another direction. I know that farmers will say that there is a great deal of humbug about this. You cannot get it out of the mind of the average farmer that this idea of feeding plants with chemicals in small quantities can never succeed. I heard a very intelligent farmer in this audience say last night, in private conversation, that perhaps you could feed plants with these materials, and get one crop, but you took it out of your land, if you did; that the land would be poorer for it afterwards; that you could not depend upon those materials to make crops permanently. You might make a hit once, but you could not depend upon it; nothing but crude, coarse matericals in bulk, in large quantities, could do the work. Now, let us see. He takes his barn-yard manure and applies it for tobacco. What has he done? Everything in that barn-yard manure of value, as the food of plants, must be estimated, weighed, and measured, by the nitrogen, potash, and phosphoric acid that are in it. That barn-yard manure is precisely what the crops were that made it, except a small deduction which has to be made for the amount taken by the animal that consumed the crop. If it is made of such food as we usually feed our cattle upon, if it is made of corn, cornstalks, and good English hay, it has in it a large percentage of phosphoric acid. There is no mistake about that, and he has applied that barn-yard manure to a crop—that is, tobacco—which takes little or no phosphoric acid; very little indeed. So far as the phosphoric acid is concerned, that is, in that manure, he has thrown it away and lost it on that crop; there is no mistake about it. Being made of hay and Indian corn, that barn-yard manure has not enough potash in it for tobacco. It is not the best manure for tobacco, put on in that form; too much phosphoric acid, too little potash. Now, I want to say, that, as a matter of economy, if he had taken potash and phosphoric acid, and mixed them for the tobacco, he would have made a manure for tobacco which would have produced a better crop than barn-yard manure will produce. There would have been economy in the mixture, because he has lost, for the present crop, the superabundance of phosphoric acid, and he has missed the potash. Now, I want to make this bold, bare statement, for the sake of attracting attention, not for the sake of being ridiculous; that any intelligent man can, in my opinion, take certain chemical substances, and go on to the old worn-out soils of New England, and grow magnificent crops, and sell them all if he chooses. He need not feed out one pound of hay; he need not feed out one single pound of grain; he may sell everything that he grows, using chemicals, and chemicals alone, as fertilizers, and make money by the process, producing magnificent crops, and at the same time bring the land back to its original fertility, full of an accumulated store of plant-food. I want to make this statement thus strong for the sake of attracting attention. You may say, 'it is all humbug; the fellow is crazy.' I do not care anything about that. It makes no difference. I want to make that statement. Remember, now, I am only talking of certain points. I do not forget the physical condition of the soil. I do not ignore under-draining. I do not ignore the organic matter in the soil. None of those things are forgotten; but, speaking of feeding plants, and restoring fertility to the land, I say, ignoring barn-yard manure, to make an extreme case, selling all your crops, and using only chemicals, you can take these worn-out lands and bring them back to their original condition of fertility, and make money all along the track.

"I am going to leave the statement of principles there, and see if I cannot prove it. This is a dull part of the subject, and you will bear with me. 'The proof of the pudding is in the eating.' Experiments were instituted at the Agricultural College in 1869 to find this out. I will not go over in detail all the long and wearisome experiments. I felt last night as if I could sit down with Professor Atwater in a corner, and cry over this matter of experiments. I sympathized with him from the bottom of my heart, for every year since 1869 I have been going through the same process—'tied to the school-bell'—as was said here last night, performing the daily routine duty at the college, and yet undertaking to carry forward an extensive series of experiments, year after year, year after year, everybody laughing at me, everybody wondering what I was fussing about; studying, thinking, paying out money to keep these experiments along, having to conduct them with the most absolute care, the most absolute exactness. There could not be any mistake here. It will not do for your Experiment Station to jump at conclusions. Those experiments must be thorough; they must be exact. The very hairs of their heads are numbered; and when that professor sits down there to pick out that lot of fibrous rootlets, he does not do it for the fun of it; he does it because he must. His experiment would be all vitiated if it is not done. I know what it is to go through these experiments year after year, year after year, and therefore, while making this statement, I will not trouble you to go with me through all the experiments. I only say, that with such soils as we could find in Massachusetts, going in different directions, and gathering them, the proof of what has been stated here to-day came out clear. It was tried over and over and over again. I could not see, with such soils as I used, on any crop that I tried it upon (and I tried it upon all our common farm crops), that lime made any difference in the growth of the plant. I made a whiter ash when I used lime on tobacco, but I did not get any larger plant; I did not get any more pounds. I could get just as good a plant. without lime as I did with, but the ashes were whiter when I used lime. I went through that whole process; I did not jump at it; and I found that I got my perfect plant with the three elements named—nitrogen, potash, and phosphoric acid. That is an old story, but I proved that we could do it in New England. That was the thing I proved we could do on just such farms as I see farmers at work upon. Taking the soil right out of their fields, I found that I could, with these three elements, make as good, or better crop, than they made by their process of agriculture.

"I suppose some scientific men will dispute me upon the next point. That was this. Does it make any difference how you mix these materials? Can you rely upon the composition of a plant being in obedience to a law? Will not the vital force make it up one year this way, and make it up another year that way? And if we feed with soda instead of potash, will not the plant take the soda? Does it make any difference with the plant how we compound these different elements? We went through with a series of experiments to answer that question, and the result was, that it was perfectly demonstrated that we got the best plants when we compounded those materials according to the agreed-upon analyses which the chemists had given us. A very large proportion of those analyses came from Connecticut. Some of them were analyses that Professor Johnson had made. Some we made at the college. Professor Johnson never analyzed an onion, or anybody else, so far as I know, and that plant with some others, we had to analyze ourselves; but I found, as a practical fact, that when I compounded my materials in such proportions as I found them in the plant agreed upon by scientists, then I had my best results. I have already stated that matter; but I say it was not guessed at, it was not jumped at. It was proved by trial after trial. While proving that this thing came up, that having the materials mixed in the proportions in which I found they were mixed by nature in the plant, I found, when I put in considerable, I got a better crop; and when it came to be tried, I very soon discovered that there was a marked relation existing between the crop and the quantity of materials applied, so that it would seem almost as if I should say to the builder, 'Here is the material to make a ton of hay, take it and make it,' and the vital force took the material and made it. That seemed to be the result arrived at.

"After having gone through with all these primary experiments, we then went out into the broad field, not only on the college farm, but on adjoining farms, and from town to town. Little packages of fertilizers were sent out from the college laboratory to known careful farmers to try this material, and report the results. The results were reported, and in every single instance the report was favorable. From plots of an eighth of an acre, we soon ran up to plots of two, three, four, and five acres. The result was the same; and finally, gentlemen, it went on from year to year, until in 1875, some six hundred acres were grown in Hampshire and adjoining counties, with materials compounded in this way. It came to be so well known that it became absolutely necessary, in order to secure the method from every man who was disposed to mix and sell this compound, and say he was selling the Stockbridge fertilizer, when he was doing precisely what this man did out here in Middletown—it became necessary, I say, to protect the thing, so that everybody could not make and sell it, because men can adulterate one thing as well as another, as was shown here last night in the case of the potash that was sold as containing sixty or seventy per cent. of potash, when it contained a very much smaller per cent. I had one case that was much worse than that. The actual trial showed that the article contained only eight per cent. of potash, although I bought it for a very much higher figure. To guard against this, an arrangement was made, and the thing was permanently fixed so that nobody could manufacture and sell that material unless he had a permit to do so. Under that arrangement, this present year, not less than four thousand acres have been cropped by this method of fertilization. The materials have been used all over the country, from Maine to Louisiana. There have been hundreds and hundreds of acres of sugar-cane grown in Louisiana by it. It has been used in Georgia, Maryland, North Carolina, and Virginia. It has been used in Connecticut. A gentleman told me last night that he had used it, although I did not know it until then. We have done now just what we wanted to do. We have sent the material broadcast over the country. We have put it into the hands of every man who asked for it. It has been used on all sorts of soils, under all sorts of varying circumstances, and in a bad season, and we have got back the results. Now, what I want to say is this: the proof comes to us, indisputable, that in this practical way, among practical men engaged in actual farming, the chemicals compounded in this way, scattered broadcast, used by everybody, have stood the test, and proved themselves competent to produce crops as well as barn-yard manure. They have proved, in this season of drought, more reliable than barn-yard manure. They have proved that they are capable of making agriculture a more certain operation than previously, enabling a man to make some sort of calculation as to the returns for his labor and capital, and that they are a decided improvement in general agriculture over any other known method of manuring. Any man can take the materials and do the same thing, I honestly believe.

"Another fact in relation to the permanent effect of this fertilizer on the land. Mr. A. comes to me and says, 'I don't want a manure that operates quick; I want a lasting manure.' That is the cry—'I want a lasting manure. I want to put a manure on my land that shall give me crops for six or seven successive years.' What in the world do you want a lasting manure for? Are you able to sustain the loss that you must receive if you use a lasting manure? Can you afford to use a lasting manure? If you have got fifty dollars' worth of manure, and you are going to put it on your land, the quicker you can get your fifty dollars back, the better you are off. Is it not better if you put your fifty dollars' worth of manure on the land in April, to get it back in December by one process of tillage, than to wait four years and till your land four times before you get your fifty dollars back in crops? My common sense tells me that it is. Then what do you want a lasting manure for? If I can manure my land this year, and get my money back, and a profit, why do I want a manure that will oblige me to lose the interest on my capital for four years before I can get it back? I do not. I want my profit just as quick as I can get it. I may be over-anxious. I may be like the little boy who had some land given him, and planted his potatoes in the morning, hoed them at noon, and dug them at night. I do not think I am; but if I use manure that has cost me money, that is valuable, the quicker I can get my money back, the better. I am speaking of plant-food, remember. If I have got a muck-bed on my farm that costs nothing but the hauling, if I have got lime that I can buy so that it does not cost more than eight dollars a ton, if I have got plaster in my neighborhood that I can get for six or seven dollars a ton, I can afford to use those materials, because they are cheap, and I can afford to wait the result; but if I am going to pay fourteen dollars a cord for barn-yard manure, or sixty dollars a ton for a commercial fertilizer, it is a matter of necessity to get that money back as quick as I possibly can. So I believe that true economy requires, in the feeding of plants, mark you, that I use manure that will give me my money back in one season, and that I do not wait for after crops. That is the first point. But the second is, that the chemical manures, as has been abundantly proven, do not leave the soil, either themselves or in their results, in one year. Now, I want to state this, as it is an absolute fact; chemical manures, like barn-yard manures, affect the soil and the plant more than one year. I do not know to-day how long. I will give you the result of an experiment, and this thing has been tried over and over on a dozen different fields, and with results all the same. I took, in 1874, a piece of worthless land, so-called, covered with red moss, no grass upon it, thrown out as an open field, because it was good for nothing, and on that land I raised, with chemicals, sixty-two bushels of shelled corn to the acre. In 1875 it was treated with chemicals, and planted again with corn (which is a bad way, but in trying experiments, we try things in a bad way sometimes for the purpose of giving them the severest test), and it produced seventy-eight bushels of shelled corn to the acre. It was seeded to herds-grass and clover, mown in 1876, and notwithstanding the drought, and the severity of the last winter, it produced twenty-five hundred pounds of well-dried hay the first crop, and when this slight snow came the other day, it was looking like an old fertile mowing field, with a close turf of fine, good grass. It had nothing put upon it but chemicals, taken in the condition I have spoken of. I feel just as sure that there is to be a heavy grass crop upon it next year as I should if it was in its present condition, and barn-yard manure had been applied. I take this one experiment for an example, and I again make the statement that you can, by using chemicals, manure your old lands, get your crops, permanently improve your lands, or take lands that do not bear grass to-day, and make them bear grass as if they had been manured with barn-yard manure.

"Now, if I have been correct in my conclusions; if there is no mistake about these experiments; if things which seem so plain that the wayfaring man, though a fool, need not err therein, are not utterly unreliable, then there are certain results which follow, which I shall bring before the Board. And the first is this. In New England, situated as we are, we need not emigrate to support and maintain ourselves as farmers as long as chemical substances can be bought. While no man should waste, misuse, or throw away barn-yard manure; while he should husband all his resources in this respect, because it is waste material; while from the cattle kept on the farm for the purposes of the dairy, and for the purpose of doing the heavy hauling, we shall have manure, and should save it all, not let a bit of it go to waste, yet on the farms where no stock are kept we can grow just such crops as we please, to any extent we please, supplementing barn-yard manure with chemicals, using the one manure us far as we have it. We need not stop or have our crops measured by the power or quantity of barn-yard manure, but having exhausted that, we can take chemicals, and go right on cropping to the extent of our farms, and do it with profit."

Having given this valuable and interesting essay of Prof. Stockbridge, I will now add that no fertilizer will make a crop grow to its full capacity, without the soil is thoroughly pulverized and "well worked" during the season of plant growth. It is folly to use fertilizers which are costly, unless good cultivation is given the crops. Experience has proven that the best method of applying mineral fertilizers is broadcast sowing just before seeding the crops, when the land is well prepared, then either harrow in the fertilizer, or else plough it in with very shallow ploughs, with cultivators, or with double showels. A good "complete plant-food" chemical fertilizer, when compared with well-rotted stable manure, rates in efficiency (by the pound) about as one to fifty, and frequently as one to seventy. A fertilizer which contains the proper proportions of nitrogen, phosphoric acid, and potash, to produce the best yield of wheat and other cereals, may be called a "complete plant-food." The evaporation of manures and chemical fertilizers by the atmosphere is much less than it is usually considered by even the best practical farmers. Nitrogenous compounds lose most heavily by leaching through the soil below the point at which plant-roots pass.

In reply to numerous inquiries whether the continued application of mineral fertilizers year after year will not, after awhile, injure the land, I will here insert three tables, which will show conclusively, to any thinking, candid mind, that chemical fertilizers do not injure land when applied according to reason and the known principles of agricultural chemistry. In looking over the experiments at Rothamsted, England, we find a record of one experiment of growing wheat on the same land for twenty years without manure. I will here give the table in full. The land was about an average for wheat:

WINTER WHEAT.

YEARS.	Bushels	Pecks.	YEARS.	Bushels.	Pecks.
1843–'4	15	0	1853–'4	21	0¼
1844–'5	23	0¾	1854–'5	17	0
1845-'6	17	3¾	1855–'6	14	2
1846–'7	16	3½	1856–'7	19	3¾
1847–'8	14	3	1857–'8	18	0
1848-'9	19	1	1858–'9	18	1¼
1849–'50	15	3¼	1859–'60	12	3½
1850-'1	15	3½	1860–'1	11	1¼
1851–'2	13	3¼	1861–'2	16	0
1852-'3	5	3¼	1862–'3	17	1

Average for first ten years, 15 bushels 3 pecks; for second ten years, 16 bushels 2 pecks. Average for the twenty years, 16.2 bushels.

In another plot, a portion of the same experimental field as above, we have the yearly yield of wheat cultivated on the same land for twenty years, chemical fertilizers being alone used each year:

YIELD OF WHEAT PER ACRE.

YEARS.	Bushels.	YEARS.	Bushels.
1843–'4	19⅜	1853–'4	49½
1844–'5	32⅜	1854–'5	33⅛
1845-'6	23¾	1855–'6	38¼
1846–'7	29¼	1856-'7	48¾
1847–'8	29¾	1857–'8	41¾
1848-'9	33¼	1858-'9	34¾
1849-'50	33¾	1859–'60	32½
1850–'1	36¾	1860–'1	36½
1851-'2	28¾	1861–'2	36¼
1852–'3	24¼	1862–'3	56½

Average for first ten years, 29.2 bushels; for second ten years, 40.8 bushels. Average for twenty years, 35 bushels.

Again, Mr. Prout, on a poor farm of 450 acres, which he bought in 1861 in Sawbridgeworth, Herts, England, used fertilizers upon small grain and other crops (as is reported in the Journal of the Royal Agricultural Society of England, page 38, 1875), and sold the entire crop standing, at auction, each year, after the cultivation was over, the purchaser harvesting and housing the same. The following table will explain his transactions:

Kind of Manure Used.		Value of manure applied to crops.			Reduced to dollars.	Total of crops sold.			Reduced to dollars.
1861.	Chemical and London dung.								
1862.		£640	0s.	0d.	$3,200	£1,640	0s	0d	$8,200
1863.						2,477	0	0	12,385
1864						2,369	0	0	11,845
1865.						2,465	0	0	12,325
1866.	Chemical	434	19	11	2,170	3,330	5	9	16,650
1867	"	529	5	3	2,645	2,423	0	9	12,115
1868.	"	1,473	6	9	7,365	4,726	0	8	23,630
1869.	"	1,282	3	5	6,410	3,742	0	0	18,710
1870.	"	1,551	16	11	7,755	5,232	7	4	26,160
1871.	"	1,254	16	5	6,270	4,625	14	11	23,125
1872	"	1,022	7	6	5,110	4,743	11	10	23,715
1873	"	1,353	0	10	6,765	4,570	4	10	22,850
1874	"	950	15	6	4,750	4,628	0	0	23,140
1875.*	"					4,630	19	6	23,150

* Value not yet known.

These tables should be attentively studied by our farmers, every one of whom I would advise by all means to begin experimenting, in a small way, with chemical fertilizers, which can be procured in Louisville or Cincinnati; and I also advise them to be careful and deal only with reliable parties, for in nothing can a cheat and fraud be palmed off upon the unsophisticated purchaser more surely than in these fertilizers, until our Legislature will do, what they failed to accomplish at its last session, pass a law to have *all fertilizers and manures* sold in the State properly analyzed, as is now done in Connecticut, Massachusetts, Virginia, North Carolina, and Georgia. A principle of fundamental importance to the farmer, is to select *the fertilizer having the ingredients of plant food that his crops need, and his soil fail to supply.* Recollect, too, that the *high-priced* fertilizers, when sold and guaranteed by *honest sellers, are nearly always the cheapest and best for the farmer.*

The value of a fertilizer is dependent on other things than the cost of the ingredients, as the mode and skill used in combining them, the adaptation to particular soils, mechanical condition, &c. I, however, will give the commercial value of the important ingredients, as near as I can ascertain them, as follows:

Available phosphoric acid	12½ cents per pound.
Ammonia	18 cents per pound.
Potash	8 cents per pound.

The *soluble* and *precipitated phosphoric acid together make the available phosphoric acid.* Some authorities put the insoluble phosphoric acid at four cents a pound; but this is doubtful as, it may be a long time in dissolving.

Then, to calculate the money value of the phosphoric acid in a fertilizer, add the soluble and precipitated together, and multiply that amount by 12½ cents (the value of one pound), which will give the value in 100 pounds, and this product by 20 (twenty times 100 pounds makes 2,000 pounds or one ton), and we have the cost of available phosphoric acid in a ton. And so of the cost of ammonia and potash.

Experiments, both in this country and Europe, have proved conclusively that any of our grain plants can be grown in perfection, by placing the seed in a jar of water, and applying the chemical constituents found in the ashes of the matured plant to the water, in the *same proportions* as they exist in the ashes of the plant. In fertilizing crops there will always exist a degree of uncertainty in predicating the results, owing to the agency of the seasons, the rain-fall, the quality of seed, and various other outside influences that may or may not happen during the growing period. Hence we cannot prophesy, with exactness, the amount of grain that a given amount of chemicals will grow; but continued experiments will teach every farmer what are the peculiar wants of his fields and crops, and instruct him how to apply the proper proportion of chemicals in order to produce certain desirable results. The system of formulas adopted by Prof. Stockbridge, based upon the analysis of each plant, and the formation of a chemical compost of potash, nitrogen, and phosphoric acid, in accordance with this analysis, is no doubt the key-note to the true method of plant-feeding, and which will, in the future, entirely revolutionize the old plan of chance farming and thoughtless soil-tillage by the educated and progressed agriculturists of our country.

In my Annual Report of last year I gave *formulas* of such chemical fertilizers as had been proven by Prof. Stockbridge and others to be well suited for the production in any desirable quantities of the various staple crops cultivated in our State. I will here give three tables made out by Prof. W. O. Atwater, the learned and accomplished chemist of the "Experiment Station" of Connecticut. By close study of these tables any farmer can learn what elements pass into his various crops, both from the atmosphere and from the soil; also what chemical elements are contained in different kinds of fertilizers; and from the last table what materials are removed from the soil by the various crops, and as a corollary to this, what fertilizers he should replace upon his soil each year to keep up the standard fertility of his lands; and also what larger amounts of chemical fertilizers, properly compounded, are needed to increase the crop yield to any desired point:

TABLE

For Calculating the Exhaustion of Soils by Crops and Enriching by Manures, Average Quantities of Water, Organic Matter, Ash, Nitrogen in Organic Matter and Potash, Lime, Phosphoric Acid, and other Ingredients in Ash, of Fresh (Green) and Air-dry Materials.

(A.)—PLANTS.

VEGETABLE MATERIALS. 1,000 lbs. contain	Water, derived through soil from air.	Organic matter, derived mostly from atmosphere.	Mineral matter, or ash, derived wholly from soil.	Nitrogen in organic matter, derived mostly from soil.	INGREDIENTS OF ASH.						
					Potash.	Soda.	Lime.	Magnesia.	Phosphoric acid.	Sulphuric acid.	Silica.
GRAIN AND STRAW.	lbs	lbs.	lbs.	lbs	lbs.	lbs.	lbs.	lbs	lbs	lbs.	lbs.
Wheat, grain	143	840.1	16.9	20.8	5.3	0.4	0.6	2.0	7.9	0.1	0.4
Wheat. straw	141	812.9	46.1	4.8	6.3	0.6	2.7	1.1	2.2	1.1	31.2
Rye, grain.	143	839.1	17.9	17.6	5.6	0.3	0.5	2.1	8.4	0.2	0.4
Rye. straw.	143	816.5	40.5	4.0	7.8	0.9	3.5	1.1	2.1	1.1	22.9
Oats, grain	143	830.0	27.0	19.2	4.4	0.6	1.0	1.9	6.2	0.4	12.0
Oats, straw	143	816.6	40 4	5.6	8.9	1.2	3.6	1.6	1.9	1.3	19.6
Indian corn, grain	144	843.0	13.0	16.0	3.7	0.2	0.3	2.0	5.9	0.2	0.2
Do. stalks & leaves	150	808.1	41.9	4.8	9.6	6.1	4.0	2.6	5.3	1.3	11.7
Buckwheat, grain	140	848.2	11.8	14.4	2.7	0.7	0.5	1.5	5.7	0.2	0.1
Buckwheat. straw	160	788.3	51.7	13.0	24.2	1.1	9.5	1.9	6.1	2.7	2.9
Beans.	145	824.3	30.7	40.8	13.1	0.4	1.5	2.2	11.9	0.8	0.2
Bean straw	160	796.1	43.9	16.3	18.5	1.1	9.8	3.3	3.2	1.6	3.2
Pease.	143	833.5	23.5	35.8	9.8	0.2	1.2	1.9	8.6	0.8	0.2
Pea straw	160	796.0	44.0	10.4	10.1	1.8	16.2	3.5	3.5	2.7	3.0
HAY.											
Average meadow hay . . .	143	805.5	51.5	15.5	13.2	2.3	8.6	3.3	4.1	2.4	13.9
Timothy hay.	143	794.9	62.1	15.5	20.4	1.5	4.5	1.9	7.2	1.8	22.1
Red clover hay.	160	783.1	56.9	19.7	18.3	1.2	20.0	6.1	5.6	1.7	1.4
Swedish clover hay	160	800.3	39.7	24.0	11.0	1.2	13.5	5.0	4.0	1.6	1.6
Lucerne (Alfalfa)	160	777.9	62.1	23.0	15.3	1.3	26.2	3.3	5.5	3.7	3.8
GREEN CROPS.											
Young grass.	800	179.3	20.7	5.6	11.6	0.4	2.2	0.6	2.2	0.8	2.1
Timothy grass	700	278.4	21.6	5.4	7.4	0.5	1.0	0.7	2.5	0 6	7.7
Fodder rye	760	223.7	16.3	5.3	6.3	0.1	1.0	0.5	2.4	0.2	5.2
Fodder corn.	822	166.0	12.0	1.9	4.3	0.5	1.6	1.4	1.3	0.4	1.7
Red clover in blossom . .	780	206.3	13.7	5.1	4.4	0.3	4.8	1.5	1.4	0.4	0.3
ROOTS (tubers) AND TOPS.											
Potatoes, tubers	750	240.6	9.4	3.4	5.7	0.2	0.2	0.4	1.6	0.6	0.2
Do. vines, nearly ripe.	770	210.3	19.7	4.9	4.3	0.4	6.4	3.3	1.6	1.3	0.9
Turnips, roots	920	72.7	7.3	1.8	3.3	0.7	0.8	0.3	0.9	0.8	0.1
Turnips, tops	898	90.1	11.9	3.0	2.8	1.1	3.9	0.5	0 9	1.1	0.5
Sugar beets, roots	815	177.9	7.1	1.6	3.9	0.7	0.4	0.5	0.8	0.3	0.1
Sugar beets, tops	897	84.9	18.1	3.0	6.5	2.7	2.7	2.7	1.3	0.9	0.7
Carrots, roots	850	142.2	7.8	2.2	2.8	1.7	0.9	0.4	1.0	0.5	0.2
Carrots, tops.	822	152.0	26.0	5.1	2.9	5.2	8.5	0.9	1.2	2.0	2.9
Hops, entire plant	140	778.6	81.4	?	20.1	2.8	18.1	6.4	7.5	3.7	16.4
Hops, the cones	120	813.2	66.8	?	23.0	1.4	11.1	3.7	11.2	2.4	11.1
Tobacco, leaves	180	769.0	151.0	34.8	30.3	5.1	62.8	17.7	4.8	5.8	13.5

(B.)—MANURES.

FERTILIZING MATERIALS. 1,000 (or 100) lbs. contain	Water.	Organic matter.	Ash.	Nitrogen (in organic matter).	INGREDIENTS OF ASH.							
					Potash.	Soda.	Lime.	Magnesia.	Phosphoric acid	Sulphuric acid.	Silica and sand.	Chlorine and fluorine.
ANIMAL EXCREMENTS. 1,000 *lbs. contain*	lbs.	lbs.	lbs	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Stable manure, fresh	710	246	44.1	4.5	5.2	1.5	5.7	1.4	2.4	1.2	12.5	1.5
Do moderately rotted . .	750	192	58.0	5.0	6.3	1.9	7.0	1.8	2.6	1.6	16.8	1.9
Do. thoroughly rotted . .	790	145	65.0	5.8	5.0	1.3	8.8	1.8	3.0	1.3	17.0	1.6
Dungheap liquor.	982	7	10.7	1.5	4.9	1.0	0.3	0.4	0.1	0.7	0.2	1.2
Fæces, fresh	772	198	29.9	10.0	2.5	1.6	6.2	3.6	10.9	0.8	1.9	0.4
Urine, human, fresh	963	24	13.5	6.0	2.0	4.6	0.2	0.4	1.7	0.4	. .	5.0
Night soil, fresh	933	51	16.0	7.0	2.1	3.8	0.9	0.6	2.6	0.5	0.2	4.0
COMMERCIAL FERTILIZERS. 100 *lbs. contain*												
Peruvian guano	14.8	51.4	33.8	13.0	2.3	1.4	11.0	1.2	13.0	1.0	1.7	1.3
Dried blood..	14.0	79.0	7.0	11.7	0.7	0.6	0.7	0.1	1.0	0.4	2.1	0.4
Phosphates.												
Bone-meal, average.	6.0	33.3	60.7	3.8	0.2	0.3	31.3	1.0	23.2	0.1	3.5	0.3
Do. from solid parts .	5.0	31.5	63 5	3.5	0 1	0.2	33.0	1.0	25.2	0.1	3.0	0.2
Do. from porous parts,	7.0	37.3	55.7	4.0	0.2	0.3	29.0	1.0	20.0	0.1	3.5	0.2
Bone black, fresh	6.0	10.0	84.0	1.0	0.1	0.3	43.0	1.1	32.0	0.4	5.0	. .
Bone black, spent	10.0	6.0	84.0	0.5	0.1	0.2	37.0	1.1	26.0	0.4	15.0	. .
Bone ash	6.0	3.0	91.0	. .	0.3	0.6	46.0	1.2	35.4	0.4	6.5	. .
Baker guano.	10.0	9.2	81 0	0.5	0.2	1.2	41.5	1.5	34.8	1.5	0.8	0.3
Jarvis guano.	11.8	8.2	80.0	0.4	0.4	0.3	39.1	0.5	20.6	18.0	0.5	0.2
Navassa phosphates	2.6	5.4	92.0	0.1	. .	. .	37.5	0.6	33.2	0.5	5.0	0.1
Superphosphates.												
Rectified Puruvian guano . .	16.0	41.9	42.1	10.0	2.0	1.2	9.5	1.0	10.5	15.0	1.5	1.1
Baker guano, superphos'ted,	15.0	6.2	78.8	0.3	0.1	0.8	25.9	0.9	21.8	28.5	0.9	0.2
Navassa, do.	5.0	2.5	82.5	. .	. .	?	17.0	0.3	15.4	19.5	2.3	?
Bone black, do.	15.0	8.0	77.0	0.3	. .	0.1	25.0	0.7	16.2	21.0	9.3	. .
Bone-meal, do.	13.0	23.8	63.2	2.6	0.1	0.2	22.4	0.7	16.6	19.5	2.5	0.2
Miscellaneous.												
Sulphate of ammonia. . . .	4.0	. .	. .	20.0	. .	. .	0.5	. .	. .	58.0	3.0	1.4
Nitrate of soda	2.6	. .	. .	15.5	. .	35.0	0.2	. .	. .	0.7	1.5	1.7
Plaster	20.0	. .	80.0	. .	. .	. .	31.0	0.1	. .	44.0	4.0	. .
Gas-lime	7.0	1.3	91.7	0.4	0.2	. .	64.5	1.5	. .	12.5	3.0	. .
Sugar-house scum	34.5	24.5	41.0	1.2	0.2	0.6	20.7	0.3	1.5	0.3	9.1	0.1
Ashes, evergreen trees . . .	5.0	5.0	90.0	. .	6.0	2.0	35.0	6.0	4.5	1.6	18.0	0.3
Ashes, deciduous trees . . .	5.0	5.0	90.0	. .	10.0	2.5	30.0	5.0	6.5	1.6	18.0	0.3
Leached ashes	20.0	5.0	75.0	. .	2.5	1.3	24.5	2.5	6.0	0.3	20.0	. .
Peat ashes.	5.0	. .	95.0	. .	1.5	0.8	?	1.5	0.6	1.3	?	0.2
Anthracite coal ashes. . . .	5.0	5.0	90.0	. .	0.1	0.1	?	3.0	0.1	5.0	?	. .

The figures for Peruvian guano are higher in nitrogen, and lower in phosphoric acid and potash, than we ordinarily find. Those for ashes will also vary somewhat from averages with us, as will be explained further on.

Here is a table showing, by calculations based upon the table just given, how much of each of the more important ingredients is removed from the soil by sundry crops of fair size :

MATERIALS REMOVED FROM THE SOIL BY VARIOUS CROPS.

	Sulphuric acid.	Phosphoric acid.	Lime.	Magnesia.	Potash.	Nitrogen.
RYE.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Grain, 25 bushels = 1,400 lbs.	0.3	11.8	0.7	2.9	7.8	24.6
Straw, 3,500 lbs.	3.8	7.3	12.2	3.9	27.3	14.0
Total	4.1	19.1	12.9	6.8	35.1	38.6
OATS.						
Grain, 30 bushels = 960 lbs	0.4	6.0	1.0	1.8	4.2	18.4
Straw, 2.000 lbs.	2.6	3.8	7.2	3.2	17.8	11.2
Total	3.0	9.8	8.2	5.0	22.0	29.6
WHEAT.						
Grain, 20 bushels = 1,200 lbs.	0.1	9.5	0.7	2.4	6.4	25.0
Straw, 3,000 lbs.	3.3	6.6	8.1	3.3	18.9	14.4
Total	3.4	16.1	8.8	5.7	25.3	39.4
CORN						
Grain, 50 bushels = 2,800 lbs.	0.6	16.5	0.8	5.6	10.4	44.8
Stalks, 6,500 lbs.	7.8	34.5	26.0	16.9	62.4	31.2
Total	8.4	51.0	26.8	22.5	72.8	76.0
HAY.						
Mixed grasses, 1½ tons = 3,000 lbs.	7.2	12.3	25.8	9.9	39.6	46.5
POTATOES.						
Tubers, 150 bushels = 9,000 lbs.	5.4	1.44	1.8	3.6	51.3	30.6
TOBACCO.						
Leaves, 1,800 lbs. (1,260 lbs. dry)	14	7.5	73	17	71	49
Stalks, 1,100 lbs. dry	3	15	15	2	47	33
Total	17	22.5	88	19	118	82

Now, these things that are removed must somehow be re-supplied. This is provided for in part by the natural processes that go on in the soil. If you were to return, in the form of stable manure, all of these materials that you remove in crops, the fertility of your land would not only be kept up, but would gradually increase. But in practice this is not done, and you have to depend on other articles, guanos, superphosphates, and the like, to make up the deficient supply.

The reader can pursue these subjects to advantage by referring to articles, "Geology and Topography of Kentucky," "Farm Chemistry and Crop Formulas," and "Plant-food and Agriculture," in this Report.

FENCES AND FENCE LAWS.

If we look at the immense amount of capital invested in fences, and the immense amount of labor and cash each year expended to keep them in repair, and to build others anew, we will become at once convinced of the great necessity of doing something to remove or lighten this over-grown burden now oppressing the agricultural industries of our country.

From the statistical reports of the Agricultural Department at Washington, and from the Agricultural Reports of the different States, I find that the total fencing in the United States has cost not less than $1,800,000,000. This is about fifty millions dollars more than the interest-bearing portion of the national debt. The value of all the live stock in the Union varies but little from the combined cost of the fences in the different States. The cost of keeping this fencing in repair, and its yearly additions and renewals, amount, in round figures, to about $200,000,000 a year. The census report of 1870 makes the value of farms in Kentucky $311,328,916. The fencing necessary, under our present system, to inclose and cross-fence about 125,000 farms now in the State, cost, in round numbers, not less than $75,000,000, estimating 600 rods of fence to each farm. To build this immense amount of fences of split rails took not less than 2,000,000,000 of rails, and 70,000,000 of good rail trees. The annual repairs of this fencing consumes 280,000,000 of rails, and over 10,000,000 of timber trees. It takes, to keep up these fences in capital and labor, not less than $10,000,000 yearly. Now the value of crops and betterments yearly upon the farms in Kentucky amount to $87,477,374, the cost of keeping up fences $10,000,000, or over 8⅞ per cent. of this amount. The live stock of all kinds is worth to the State nearly $25,000,000 per annum, to keep up the restraining fences $10,000,000, or largely over one third of this amount.

These figures look appalling, yet, when the farmer thinks over the labor, the use of tools, the cash paid out, the wagons and teams worn out and destroyed, and the immense injury done to his lands by the use of timber and winter hauling, he will see that figures, in fencing items, "cannot lie."

We fence to keep our own stock *in*, and that of our neighbors *out*. We keep a dead capital in fences, rotting and disappearing more or less every year, greater than the value of our live stock, for which these fences are made. The yearly loss to the State, by the use of this expensive luxury, *fencing*, is equal to more than one third of the value of stock raised each year. Is it wise in us to continue this extravagant system, particularly in those counties where the lands are high in price, nearly all cleared, and where timber trees are becoming scarce? In one half of our State timber is plenty and cheap, so that the farmers in that portion can still afford, though not wisely, to waste it in fences or burn it in log-heaps; but in the other half, timber trees are getting scarce and becoming very valuable, and should be protected before it is too late to save them for all kinds of future emergencies.

Like other older States and countries, we must, in Kentucky, begin to husband our trees and forests, unless we wish to make our State desolate through want of shade, as are now many parts of Europe, Asia, and Africa. The article on Forestry, in this volume, will explain the necessity of forest growths in all countries.

Now the question arises, how shall we better ourselves on the fence outlays, which are yearly depriving the farmers of not less than ten per cent. of their daily labor? To answer this question, we must look to the experience of countries which have been thickly populated for many thousands of years. In Japan and China, where agriculture has been carried to as great perfection as on any part of the globe, and where the largest population is supported to the average square mile of any countries on earth, fences have been, for thousands of years, dispensed with as boundary lines between different farms, and every land-owner, or his tenant, has been obliged, by strict laws, to keep all his live stock inclosed in "closes," or lots or fields, so that they cannot intrude upon the growing crops of the country, which are cultivated in the "commons," and around which are no fences, and where only corner rocks and imaginary lines show the limits of the different estates. The sole object of fences in these countries is *to keep stock in*, never to *keep stock out*, and should any stock break the "close," and injure another man's crop, the owner of the stock is liable for all damages done by the trespass. All provisions and provender are gathered and fed in stables or lots; and if any stock is put out to graze, they are guarded by a herdsman or shepherd, or else confined by a movable fence.

The same custom, with but slight variations, prevails in all the German States, and France, Italy, Spain, and Portugal, in Europe, as well as on the British Isles. Local laws in some of the States of the American Union provide for special counties and neighborhoods, systems of fencing by which all the people may be benefited. For instance, in North Carolina, many counties are allowed, by a vote of the county, to levy a tax on the real estate of the county sufficient to create a fund to fence in the entire county under one fence, with gates upon all roads leading out of the county. These county fences are "kept up" by the county, and every farmer within the county can cultivate his crop unfenced, and he is compelled by law to keep inclosed all his live stock, being subject to pay damages for any trespasses committed by them—a special lien bearing on the trespassing stock for such damages. Two or more counties can unite in building the same fence, or any township within a county can in like manner tax itself, and make, and keep up its own fence in common.

This law works well in North Carolina, and I hope to see a similar law passed by the next Kentucky Legislature for the counties in our Commonwealth that are deficient in timber.

Such a law, if carried into effect, would save vast sums of money to the farmers of our State, especially to those living in all the Blue grass counties, as well as to those living on the barren or prairie counties of Southern and Southwestern Kentucky. Our farmers should have this subject discussed by the candidates offering for election to our Legislature, until some plan is adopted which will relieve them of the immense burdens now consuming their labor and their purses.

The North Carolina plan will save over three fourths of the present outlay, and afford large quantities of fertilizers (barn-yard manures) by the new system of feeding, besides preserve the crop lands from hard tramping in muddy weather. Then, by all means, let our farmers act in concert in this matter and protect themselves.

HOG PRODUCTS—PORK-PACKING.

One of the most profitable branches of farming in Kentucky is "hog-raising." Every part of the State is well adapted to this industry, which has become a source of a large influx of wealth each year. I will give, for the guidance of those interested, a series of tables, illustrative of the pork-packing trade, and the commercial interests flowing from it, which may be of great importance to our merchants, farmers, and speculators. Several of these most important tables have been kindly furnished me by Chas. B. Murray, Esq., the reliable, highly educated, and well-posted editor of "The Cincinnati Price Current," whose reputation as a statistician gives confidence in the accuracy of all his tabulated statements. By close study of these tables, the reader will be enabled to form a very correct idea of the meat business, not only of Kentucky, but also of the West, and of the whole country.

According to the estimates of the Department of Agriculture at Washington, the *total number of hogs* in the different States and Territories of the Union for the three years 1876, 1877, and 1878 were as follows:

Hogs in the United States.

	1878.	1877.	1876.
Ohio	2,250,000	1,755,700	1,596,100
Indiana	2,422,500	2,375,000	2,136,000
Illinois	2,900,000	2,750,000	2,640,100
Iowa	2,950,000	3,263,200	3,296,200
Missouri	2,585,600	2,560,000	1,874,300
Kansas	431,700	359,800	246,500
Nebraska	255,700	170,500	80,900
Minnesota	180,000	215,500	213,400
Wisconsin	635,300	562,300	540,700
Michigan	556,100	505,600	459,700
Kentucky	1,950,000	1,588,200	1,604,300
Tennessee	1,900,000	1,087,900	1,026,400
West Virginia	281,500	270,700	248,400
Thirteen packing States	19,298,400	17,464,400	15,963,000
Maine	62,200	59,900	58,800
New Hampshire	42,900	38,700	37,300
Vermont	54,300	53,300	51,800
Massachusetts	78,600	78,600	75,600
Rhode Island	18,100	17,100	16,300
Connecticut	59,500	58,400	57,900
New York	975,000	580,000	568,700
New Jersey	154,400	151,400	153,000
Pennsylvania	937,200	901,200	875,000
Delaware	47,600	46,700	46,700
Maryland	259,600	252,100	233,500
Virginia	759,200	607,400	589,800
North Carolina	1,180,000	735,500	758,300
South Carolina	450,000	284,100	275,900
Georgia	1,586,900	1,483,100	1,360,700
Florida	190,000	166,600	175,400
Alabama	952,300	793,600	755,900
Mississippi	1,284,400	1,189,300	792,900
Louisiana	350,000	242,600	222,600
Texas	1,716,700	1,144,500	1,090,000
Arkansas	1,040,300	1,000,300	901,200
California	438,500	417,700	363,300
Oregon	198,100	188,700	181,500
Nevada	10,800	5,400	5,200
Colorado	12,500	.....	....
The Territories	105,000	116,500	116,500
Total	32,262,500	28,077,100	25,726,800

In the thirteen Western packing States there is shown an increase, this year, of 1,834,000, and for the entire country an increase of 4,185,400, compared with last year.

Number of swine reported in the United States in previous years:

1875	28,062,200	1872	31,796,300
1874	30,860,900	1871	29,457,500
1873	32,632,050	1870	26,751,600

According to information given through Mr. Murray's tables, we find the winter packing in Kentucky for the three years, 1875–'6, 1876–'7, 1877–'8, to be as follows:

Hogs packed from November 1 to March 1, each year, in Kentucky:

	1877–'8.	1876–'7.	1875–'6.
Augusta	325	350	225
Bardstown	400	500	190
Bowling Green	14,380	11,616	10,320
Danville	885	1,283	919
Elizabethtown and vicinity	1,500	5[illegible]0	800
Frankfort	900	1,000	1,100
Franklin and vicinity	400	....	....
Glasgow	1,000	1,000	800
Lexington	8,250	11,500	9,500
Maysville	6,354	8,850	9,845
Munfordsville	393	....	519
Owensboro	1,200	900	850
Paducah	1,200	1,100	1,300
Princeton	1,000	1,800	1,500
Other points	....	425	1,433
Interior points	38,887	41,124	40,601
Louisville	279,414	214,862	223,147
Total Kentucky	318,301	255,986	263,748

Winter Packing.—The *winter packing* for these three years, as well as the weight of hogs, lard per hog, and price per hundred pounds, and also the gains and losses thoughout the Western States, may be seen in the following three tables:

Comparisons by States.—Total number of hogs packed in the West from November 1 to March 1, average net weight, average yield of lard per hog, and cost of hogs per 100 pounds net:

Winter Packing, 1877–'8.

States.	Number.	Weight.	Lard.	Cost.
Ohio	934,132	223.85	39.00	$5.15
Indiana	496,025	214.32	34.42	4.93
Illinois	2,714,748	229.57	39.73	5.10
Iowa	486,850	220.53	37.70	4.48
Missouri	804,614	219.74	39.12	4.82
Kansas	41,470	267.48	42.20	4.36
Nebraska	56,000	232.28	47.71	4.40
Minnesota	23,700	261.10	44.11	4.42
Wisconsin	412,614	236.51	39.14	4.83
Michigan	120,095	234.88	36.94	4.83
Kentucky	318,301	223.72	34.67	5.35
Tennessee	66,897	208.65	31.58	5.03
Miscellaneous	30.000	215.33	32.46	5.31
Total	6,505,446	226.04	38.61	4.99
Total 1876–'7	5,101,308	215.92	34.08	7.18
Total 1875–'6	4,880,135	217.71	35.45	8.82

Winter Packing, 1876–'7.

States.	Number.	Weight.	Lard.	Cost.
Ohio	813,709	218.15	36.49	$7.20
Indiana	530,286	199.41	29.69	7.02
Illinois	1,905,219	218.09	35.19	7.42
Iowa	419,442	207.75	33.26	6.82
Missouri	644,699	213.93	33.88	7.05
Kansas	31,775	240.41	37.16	6.61
Nebraska	46,190	220.39	38.10	6.78
Minnesota	24,235	249.94	29.30	6.49
Wisconsin	266,861	226.67	30.73	7.11
Michigan	88,689	232.35	32.90	6.92
Kentucky	255,986	222.52	33.10	6.99
Tennessee	50,770	208.04	31.48	6.74
Miscellaneous	23,447	213.70	32.39	7.16
Total	5,101,308	215.92	34.08	7.18

Gains and Losses in 1877–'8.

States.	Number.	Weight.	Lard.	Cost.
Ohio	120,423 inc.	5.70 inc.	2.51 inc.	2.05 dec.
Indiana	34,261 dec.	14.91 "	4.73 "	2.09 "
Illinois	809,529 inc.	11.48 "	4.54 "	2.32 "
Iowa	67,408 "	12.78 "	4.41 "	2.31 "
Missouri	159,915 "	5.81 "	5.24 "	2.23 "
Kansas	9,695 "	27.07 "	5.04 "	2.25 "
Nebraska	9,810 "	11.89 "	9.16 "	2.38 "
Minnesota	535 dec.	11.16 "	14.81 "	2.07 "
Wisconsin	145,753 inc.	9.84 "	8.41 "	2.28 "
Michigan	31,406 "	2.53 "	4.04 "	2.09 "
Kentucky	62,315 "	1.20 "	1.57 "	1.64 "
Tennessee	16,127 "	.63 "	.10 "	1.71 "
Miscellaneous	6,553 "	1.63 "	.07 "	1.85 "
Total	1,404,138 inc.	10.12 inc.	4.53 inc.	2.19 dec.

There is exhibited by these tables a marked increase in the weight of hogs, and a decrease in the prices paid the farmer for stock. This latter averages a full decline of $2 19 per hundred pounds.

Summer Packing in the West.—Ice-cured bacon made from hogs slaughtered during the summer months is becoming more popular among consumers each year. The number of hogs used for summer packing increases as the demand for this kind of meat grows. The summer packing season begins on March 1 and ends November 1. The following tables will show the extent of this branch of business in the Western States:

Summer Packing in the West.—Number of hogs packed in the West during the summer season, March 1 to November 1:

	1877.	1876.
Chicago	1,508,026	1,315,402
Cincinnati	134,416	121,173
St. Louis	148,277	131,158
Milwaukee	54,785	60,827
Louisville	19,800	9,500
Indianapolis	204,264	283,621
Total at six cities	2,069,568	1,921,681

Cleveland, Ohio	146,048	187,392
Cedar Rapids, Iowa	110,130	105,580
Des Moines, Iowa	34,503	28,689
Keokuk, Iowa	16,000	.....
Waterloo, Iowa	15,000	6,750
Sabula, Iowa	3,417	263
Kansas City, Missouri	77,821	66,754
Detriot, Michigan	34,028	24,000
Toledo, Ohio	4,971	.....
Washington Court-house, Ohio	3,000	.....
Chillicothe, Ohio	1,700	1,000
Quincy, Illinois	4,500	.....
Canton, Illinois	2,750	6,837
Charleston, Illinois	1,600	.....
Peoria, Illinois	2,500	.....
Lafayette, Indiana	3,000	.....
Wheeling, West Virginia	2,934	1,300
At other places	9,630	7,700
Total number, all points	2,543,120	2,307,866
Increase	235,254	
Average gross weight, pounds	218.21	230.12
Average net weight, pounds	190.57	184.10
Aggregate net weight, pounds	484,653,471	424,879,300
Average yield of lard, pounds	33.56	30.35
Aggregate pounds of lard	85,364,176	70,040,980
Tierces of lard, 330 pounds each	258,679	212,245

Special reports to the Cincinnati Price Current show the packing since March 1 to date and latest mail dates, at the under-mentioned places, as follows:

September 18—	1878.	1877.
Cincinnati	122,000	107,500
Chicago	1,595,000	1,160,000
Indianapolis	245,000	166,000
St. Louis	117,000	118,000
Milwaukee	57,000	31,093
Cedar Rapids	152,867	92,978
Cleveland	180,547	119,421
Other places, approximately	127,000	136,000
Total	2,596,414	1,930,992

By adding the winter and summer packing for the past six years, beginning and ending on March 1 each year, we have the following totals:

Yearly Comparisons.—For the twelve months ending March 1, the number of hogs packed in the West compares for six years as follows:

	Summer.	Winter.	Total.
1877–'8	2,543,120	6,505,446	9,048,566
1876–'7	2,307,866	5,101,308	7,409,174
1875–'6	1,262,343	4.880,135	6,142,478
1874–'5	1,200,444	5,566,226	6,766,670
1873–'4	1,062,916	5,466,200	6,529,116
1872–'3	505,500	5,410,314	5,915,814

The aggregate net weight of hogs and pounds of lard for six years, ending March 1, compare as follows:

	Net weight of hogs, pounds.	Pounds of lard.
1877–'8	1,955,160,434	336,557,676
1876–'7	1,526,357,390	243,918,870
1875–'6	1,286,301,741	208,831,900
1874–'5	1,364,512,267	221,880,256
1873–'4	1,369,640,599	222,566,195
1872–'3	1,353,564,283	232,212,585

The six principal cities of the West show the following results in winter packing:

Packing at the Six Principal Cities.—Number of hogs packed at the six large cities in the West from November 1 to March 1:

	1877–'8.	1876–'7.	Increase.	Decrease.
Chicago	2,501,285	1,618,084	883,201	.....
Cincinnati	632,302	523,576	108,726	.....
St. Louis	509,540	414,747	94,793	.....
Milwaukee	371,982	225,598	146,384	.....
Louisville	279,414	214,862	64,552	.....
Indianapolis	270,150	294,198	....	24,048
Total	4,564,673	3,291,065	1,273,608	.....

	Net weight.			Yield of lard.		
	1877–'8.	1876–'7.	Increase.	1877–'8.	1876–'7.	Increase.
Chicago	228.37	215.97	12.40	39.60	35.10	4.50
Cincinnati	227.25	219.77	7.48	40.96	38.20	2.76
St. Louis	216.02	206.42	9.60	38.20	32.55	5.65
Milwaukee	232.64	221.73	10.91	39.81	30.25	9.56
Louisville	222.89	221.12	1.77	34.83	32.62	2.21
Indianapolis	195.43	182.50	12.93	32.05	26.50	5.55
General average	224.95	213.11	11.84	38.91	34.00	4.91

These tables show a general steady increase each year, both in the number of hogs and the average weights. The improvement in breeds of stock hogs has caused farmers to sell their pork hogs at an average of several months younger than was the case twenty-five years ago. To show fluctuations of prices, and the increase in numbers, I will give the following table:

Winter Pork Packing in the West for Twenty-nine years.—Total number of hogs packed during the winter season, with average cost of hogs per 100 pounds, dressed and gross, according to Cincinnati Price Current reports:

Seasons.	Number packed.	Cost, net.	Cost, gross
1877–'78	6,505.446	$4 99	$3 99
1876–'77	5,101,308	7 18	5 74
1875–'76	4,880,135	8 82	7 05
1874–'75	5,566,226	8 33	6 66
1873–'74	5,466,200	5 43	4 34
1872–'73	5,410,314	4 66	3 73
1871–'72	4,831,558	5 15	4 12
1870–'71	3,695,251	6 58	5 26
1869–'70	2,635,312	11 53	9 22
1868–'69	2,499,873	10 22	8 18
1867–'68	2,781,084	7 95	6 36
1866–'67	2,490,791	7 22	5 78
1865-'66	1,785,955	11 67	9 34
1864–'65	2,422,779	14 32	11 46

1863–'64	3,261,105	6 70	5 36
1862–'63	4,069,520	4 20	3 36
1861–'62	2,893,666	3 03	2 42
1860–'61	2,155,702	5 67	4 57
1859–'60	2,350,822	5 91	4 73
1858–'59	2,465,552	6,28	5 02
1857–'58	2,210,778	4 86	3 89
1856–'57	1,818,468	5 94	4 75
1855–'56	2,489,502	5 75	4 60
1854–'55	2,124,404	4 21	3 37
1853–'54	2,534,770	4 19	3 35
1852–'53	2,201,110	6 01	4 81
1851–'52	1,182,846	4 45	3 56
1850–'51	1,332,867	3 75	3 00
1849–'50	1,652,220	2 66	2 13

The aggregate number of hogs packed in twenty-nine winter seasons is 90,815,564. The average winter price for twenty-nine years is $6 46 net, or $5 17 gross. Omitting the six seasons from 1861–'5 to 1869–'70, inclusive, the average for the remaining twenty-three seasons is $5 42 net, or $4 34 gross.

Pacific Slope.—The number of hogs packed west of the Rocky Mountains is steadily on the increase, as are also the beeves and sheep butchered in that part of our Union. The cattle slaughtered at San Francisco in 1877 are estimated at 4,200, and sheep at 122,000.

The number of hogs packed at San Francisco, and the estimated number, including other parts of the State, have been reported for four calendar years as follows:

	1877.	1876.	1875.	1874.
San Francisco	135,000	175,000	90,000	230,000
Interior places	85,000	55,000	80,000	160,000
Total for the State	220,000	230,000	170,000	390,000
Oregon	90,000	75,000	65,000	60,000
Total	310,000	305,000	235,000	450,000

The Eastern States.—The number of hogs raised in the Eastern States is relatively less than in the West. The high price of corn, no doubt, makes it less profitable to produce pork in New England or New York than it would be if the cheap transportation did not bring the markets of the four large cities—Boston, New York, Philadelphia, and Baltimore—immediately in competition with the West for all kinds of meats and breadstuffs. A large quantity of the fresh meat used in these cities comes through from the West on the cars and canals, and is prepared for market or shipment at these seaboards. The following tables will give a general review of the movement of the hog trade at the principal seaboard cities:

Winter Receipts.—Detailed receipts of hogs at seaboard for two winter seasons, November 1 to March 1:

	1877–'8.		1876–'7.	
	Live.	Dressed.	Live.	Dressed.
Boston	141,933	27,907	126,762	66,433
New York	636,127	38,229	469,042	65,880
Philadelphia	93,600	37,250	95,840	31,340
Baltimore	128,916	25,000	88,445	20,000

Total receipts of live and dressed hogs for four winter seasons:

	1877–'8.	1876–'7.	1875–'6.	1874–'5.
Boston	169,840	193,195	161,412	248,949
New York	674,356	534,922	490,901	687,425
Philadelphia	130,850	127,180	120,750	117,260
Baltimore	153,916	108,445	114,328	132,500
Total	1,128,962	963,742	887,391	1,186,134

Compared with winter of 1876–'7, the increase in 1877–'8 was 165,220 Boston 23,355 decrease, New York 139,434 increase, Philadelphia 3,670 increase, Baltimore 45,471 increase.

Summer Receipts.—Detailed receipts of hogs at seaboard for two summer seasons, March 1 to November 1:

	1877		1876	
	Live.	Dressed.	Live.	Dressed.
Boston	213,634	9,565	233,562	6,688
New York	774,157	17,785	757,144	7,222
Philadelphia	210,750	22,400	201,600	18,400
Baltimore	196,107	5,000	175,631	5,000

Total receipts of live and dressed hogs for four summer seasons:

	1877.	1876.	1875.	1874.
Boston	223,199	240,250	233,353	345,441
New York	791,942	764,366	891,366	1,107,555
Philadelphia	233,150	220,000	204,365	181,330
Baltimore	201,107	180 631	180,447	247,655
Total	1,449,398	1,405,247	1,509,531	1,881,981

Compared with summer of 1876, the increase in 1877 was 44,151. Boston 17,051 decrease, New York 27,576 increase, Philadelphia 13,150 increase, Baltimore 20,476 increase.

Year Ending March 1.—Total receipts of hogs at four seaboard cities for twelve months ending March 1, for four years:

	1877–'8.	1876–'7.	1875–'6	1874–'5.
Live	2,395,224	2,148,026	2,213,639	2,867,752
Dressed	183,136	220,963	183,283	200,363
Total	2,578,360	2,368,989	2,396,922	3,068,115

Albany and Troy.—The number of hogs packed at Albany and Troy, New York, November 1 to March 1, is reported as follows:

Nov. 1 to March 1—	Albany.	Troy.	Total.
1877–'8	40,000	15,000	55,000
1876–'7	30,000	15,000	45,000
1875–'6	44,238	22,500	66,738
1874–'5	55,315	25,000	80,315

At Albany, the summer packing is usually about five thousand head; none at Troy.

Buffalo.—The number of hogs packed at Buffalo compares as follows:

	1877–'8.	1876–'7.
March 1 to November 1	71,425	78,800
November 1 to March 1	68,505	56,450
Twelve months ending March 1	139,930	135,250

Having now reviewed the hog-packing by sections, we will proceed to *recapitulate*, and produce a table giving the total results of this great industry for the whole Union, excepting the Southern States. This table will consequently contain the general aggregate of all the mercantile pork packed in the section named.

Total Number of Hogs Packed and Marketed—The West, the East, the Pacific Coast, and Canada.—Total number of hogs packed and marketed in the sections mentioned from November 1 to March 1:

Winter season—	1877–'8.	1876–'7.
Packed in the West	6,505,446	5,101,308
Packed at Buffalo, Albany, and Troy	123,505	101,450
Packed on Pacific Coast	110,000	105,000
Packed in Canada	151,781	186,198
Receipts at four seaboard cities	1,128,962	963,742
Aggregate number	8,019,694	6,457,698
Increase in 1877–'8	1,561,966	

Total number of hogs packed and marketed in the sections specified, March 1 to November 1:

Summer season—	1877.	1876.
Packed in the West	2,543,120	2,307,866
Packed at Buffalo and Albany	76,425	82,800
Packed on Pacific Coast	200,000	200,000
Packed in Canada	12,957	58,544
Receipts at seaboard	1,449,393	1,405,247
Aggregate number	4,281,895	4,054,457
Increase, 1877	227,438	

Total for twelve months, ending March 1:

	1877–'8.	1876'–7.
Winter supply	8,019,694	6,457,898
Summer supply	4,281,895	4,054,457
Aggregate number	12,301,589	10,512,155
Increase, 1877–'8	1,789,434	

Weight and production of the above reported supply of hogs for the year:

	1877–'8.	1876–'7.
Net weight of hogs, pounds	2,548,343,011	2,050,056,050
Green meats, all kinds, pounds	1,783,840,107	1,435,039,235
Production of lard, pounds	407,734,880	318,295,360
Tierces of lard, 330 pounds	1,235,560	964,531

The market for the immense amount of hog products exhibited by these tables, except what is used at home, is found mostly in the cotton-growing States of the Union, and in foreign countries. I will here insert tables of the exports of hog products, and also the countries in which they are sold:

Yearly Exports of Hog Product—Comparisons with Western Yearly Production.—Exports of pork and bacon (including hams and shoulders) for the crop year November 1 to October 31, for six years:

Year ending Oct. 31.	Pork, lbs.	Bacon, lbs.
1877	68,831,674	444,117,507
1876	57,838,184	388,218,023
1875	62,247,881	264,214.959
1874	62,745,923	322,921,719
1873	63,865,621	415,228,587
1872	60,617,535	263,939,263

Total exports of pork and bacon, compared with the annual production of meats in the West, and the percentage relation to total exports, for six years:

Year ending Oct. 31.	Meats exported, lbs.	Production of meats, lbs.	Percentage exported.
1877	512,949,181	1,057,421,041	48.59
1876	446,056,207	991,556,881	44.98
1875	326,462,840	927,656,785	35.19
1874	385,667,642	914,666,521	42.16
1873	479,094,208	968,021,941	49 49
1872	324.556,798	797,218,923	40.71

Total exports of lard, compared with the annual production of lard in the West, and the percentage relation to total exports, for six years:

Year ending Oct. 31.	Lard exported, lbs.	Production of lard, lbs.	Percentage exported.
1877	237,744,307	259,242,066	91.77
1876	197,847,986	243,057,568	81.40
1875	167,548,916	226,195,822	74.07
1874	177,028,346	222,943,684	79 40
1873	234,897,521	247,967,566	95.53
1872	207,006,713	204,930,967	[*]101.00

Aggregate exports of meats and lard, compared with the annual production of the same in the West, and the percentage of total product represented by exports for six years, ending October 31:

Year.	Total product exported, lbs.	Production of meats & lard, lbs.	Percentage exported.
1877	750,693,488	1,316,663,107	57.01
1876	643,904,193	1,234,614,441	52.15
1875	494,011,756	1,153,852,707	42.81
1874	562,695,988	1,137,610,205	49.46
1873	713,991,729	1,215,989,506	58.71
1872	531,563,511	1,002,149,890	53.04

Distribution of Provisions Exported.—Compiled from statistics furnished by Hon. Edward Young, Chief of Bureau of Statistics, Washington, showing the countries to which provisions were chiefly exported from the United States, and the quantities, during twelve months, ending June 30, 1877:

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[*] NOTE.—It should be borne in mind that the exports include more or less product manufactured at seaboard cities, etc., each year, and it is therefore impossible to determine what proportion of the Western manufacture is sent abroad. In 1872 the exports of lard slightly exceeded the amount made in the West; during that year the receipts of live hogs at the four seaboard cities were 3,050,000, which probably produced about 75,000,000 pounds lard.

Countries.	Bacon,* lbs.	Pork, lbs.	Lard, lbs.
England	322,116,729	19,793,191	66,196,750
Scotland	31,193,969	2,847,346	8,096,852
France	23,167,236	179,500	23,788,669
Germany	23,715,093	1,251,166	58,038,751
Belgium	30,846,038	141,800	23,882,271
Cuba	10,813,912	431,662	21,665,367
Hayti	264,492	10,206,115	1,105,527
Porto Rico	610,341	2,923,975	2,030,257
British West Indies	1,241,484	6,764,890	2,232,281
British Guiana	227,037	3,102,600	707,060
United States of Colombia		477,651	4,549,995
Brazil			4,267,310
Spain	1,004,849		160,522
Sweden and Norway	5,278,228		
Netherlands	4,442,709		5,597,166
Quebec, Ontario, etc.	3,279,802	9,410,730	5,639,183
Nova Scotia	95,339	3,239,450	358,333
Newfoundland		4,333,660	
Other countries	1,759,888	3,568,158	6,424,909
Total	460,057,146	69,671,894	234,741,233
Value	$49,512,412	$6,296,414	$25,562,665
Year ending June 30, 1876	327,730,172	54,195,118	168,405,839
Value	$39,664,456	$5,744,022	$22,429,485

* Includes sides, hams, and shoulders.

The "hog crop" each season depends upon two things, either of which produces effects most marked upon the production of this branch of farming. The first of these is the size and quality of the corn crop. From this the hog is emphatically created. So much so, indeed, that without this great native cereal the hog crop would amount to but little, and pork-packing be of small importance in commerce.

The second is "hog cholera," a disease that, since the year 1856, has most seriously injured hog production in the United States everywhere south of 40° of north latitude and west of the Allegheny Mountains in Pennsylvania. This or kindred diseases, according to the estimates of the Department of Agriculture, kill annually about 4,000,000 of hogs in the United States, worth nearly $24,000,000. It is to be hoped that the commission appointed by Congress to investigate this disease will find some remedy which will be an antidote against its yearly ravages.

Corn Crop.—That the reader may know how important the corn crop is in connection with the pork crop, I will here give tables regarding this staple, and also of the prices of mess pork, which are invaluable to farmers and pork dealers.

Average Prices of Corn.—Monthly and yearly average prices of corn in Cincinnati for thirty years, compiled from the weekly quotations of the Cincinnati Price Current:

	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
January	32	27	31	40	28	42	40	60	40	52
February	27	25	32	39	28	43	46	64	39	53
March	25	25	36	37	28	40	45	66	39	56
April	28	26	38	37	27	41	49	75	34	57
May	27	27	46	37	28	40	53	78	34	77
June	26	31	50	37	30	43	52	75	36	74
July	30	33	48	37	32	48	46	71	40	70
August	31	36	50	37	39	55	50	70	48	67
September	32	38	49	34	43	55	68	55	54	55
October	28	34	44	34	41	55	65	59	55	43
November	27	27	33	32	40	41	57	53	52	37
December	28	30	37	29	37	41	58	41	50	29
Yearly average,	30	30	41	36	33	45	52	64	43	56

	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
January	31	75	54	35	28	50	110	110	54	61
February	39	79	49	34	30	66	102	100	51	62
March	35	79	49	33	34	66	95	91	48	67
April	36	80	45	33	33	62	109	71	52	89
May	40	85	48	34	36	57	117	73	58	91
June	51	81	47	28	32	55	114	65	62	78
July	54	82	45	29	33	57	116	68	63	75
August	56	78	41	28	35	60	123	66	58	88
September	56	73	48	27	44	73	124	65	68	105
October	50	61	41	30	40	88	114	55	82	104
November	55	45	35	29	47	98	122	52	89	93
December	66	49	32	28	45	95	118	50	79	87
Yearly average,	47	72	45	31	36	69	114	72	64	83

	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877
January	90	67	77	52	48	41	60	67	41	44
February	84	64	72	55	47	40	59	67	42	41
March	86	65	74	57	45	39	63	68	47	41
April	89	65	87	57	49	41	66	73	50	45
May	96	66	98	55	52	48	70	76	48	50
June	93	65	95	56	50	43	66	70	43	48
July	88	79	92	53	49	46	66	72	46	48
August	93	95	83	51	45	46	66	75	44	47
September	99	96	72	52	45	53	81	68	47	48
October	100	87	62	54	41	49	78	60	48	45
November	74	94	52	49	33	50	72	61	47	41
December	68	83	51	47	41	57	69	60	44	39
Yearly average,	88	77	76	53	46	46	68	68	46	45

Corn Crop of the United States.—The total corn crop of the United States compares, for a series of years, as follows:

Year.	Bushels.	Year.	Bushels.
1877	1,340,000,000	1871	991,898,000
1876	1,283,827,500	1870	1,094,255,000
1875	1,321,069,000	1869	874,320,000
1874	850,148,500	1868	906,527,000
1873	932,274,000	1867	768,320,000
1872	1,072,719,000	Average 11 years	1,039,578,000

Price of mess pork, per barrel, from 1870 to 1877, monthly:

Month.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.
January	$27 30	$20 50	$13 30	$12 70	$15 75	$18 75	$20 15	$17 40
February	26 70	22 15	13 20	13 20	15 05	18 90	22 05	15 90
March	26 40	21 05	12 25	15 25	15 70	20 25	23 00	14 50
April	28 40	19 00	13 50	17 30	17 00	22 10	22 15	15 35
May	29 45	16 75	14 15	17 35	17 75	22 00	20 55	14 75
June	29 10	15 25	13 40	16 25	17 95	19 60	19 30	13 60
July	30 05	14 90	12 95	16 55	21 05	19 85	20 20	13 90
August	28 75	12 25	13 60	16 50	23 50	21 30	17 75	13 05
September	25 95	12 65	13 50	15 80	23 00	21 50	16 45	12 90
October	25 45	12 70	14 10	14 10	. . .	22 05	16 70	14 00
November	21 50	12 70	13 35	12 45	20 50	21 40	16 05	12 55
December	18 80	13 60	12 00	15 25	19 50	20 20	16 40	11 85
Yearly average	$26 50	$16 10	$13 30	$15 20	$18 80	$20 65	$19 40	$14 15

The price of corn and pork in Cincinnati and Louisville gives tone to the value of each of these commodities throughout the State of Kentucky.

THE INFLUENCE OF INVENTIONS UPON LABOR.

Probably there is no subject that is destined to demand the serious consideration of statesmen and of the laboring classes and capitalists in the near future, than that which heads this chapter. Man is progressing; civilization is expanding; the human mind is disenthralled from the chains of slavery by which it has been bound down during the long-reaching ages of the past. In tracing the history of man, we find that whenever the trammels of slavery and priestly superstitions have been removed from the human intellect, civilization at once began to advance, and inventions beneficial to the race immediately came into use. This we discover to be the case under the democratic system of Athenian government, the Republican system of Rome, and the constitutional commonwealths of England, France, and the United States. Set the mind of man free from the oppression of despotic laws and superstitious priest-craft, and at once it begins to think. Free thought leads to the establishment of truthful philosophies and experiments; experiments lead to discoveries; discoveries lead to the investigation of natural laws, and this to inventions. Inventions advance civilization, and add to the comforts and pleasures of the great masses of mankind. Nations, like individuals, advance by free thought, and when free from the despot's control, establish schools, bureaux and experimental stations, and patent offices for the purpose of teaching the masses the use and application of inventions, and the sciences applicable to the every-day concerns of life. Thus we find in England, France, Germany, the United States, and the individual States of the Union, institutions continually arising for the purpose of experimenting and giving the results to the people, as facts or theories, for their application to the various kinds of businesses which go to make up the trades of the country. The object is to teach and to instruct mankind, to survey and to mark out the safe and profitable channels for society, and to buoy out the dangerous rocks which may be hidden from superficial observation.

Man must follow nature's laws, as well in his social relations as in the cultivation of the soil, in the business routine of life as in the physical development of our bodies. Society is still in its childhood, and unless it is well nursed by the advanced, thinking, philosophical brains, which occasionally come to the surface, it must, of necessity, flounder and strike roughly against the rocks of ignorance and superstition, or of selfishness and tyranny, in its progress from childhood to youth. The endless diversity of bonds by which society is held together, and the many diverse interests that must be harmonized, show that a watchful and careful study of every phase that characterizes each step of civilization must be skillfully examined and honestly guarded. The relation of labor and capital, of money and trade, of supply and demand, of production and consumption, of law and justice, of public and private service, of health and disease, of poverty and riches, of education in the sciences and arts, of morality and religion, and of all other problems which come up practically for solution in the every-day routine of life, may be considered as special subjects that influence the progress of man for better or worse in his social relations.

The present period of agricultural and commercial depression is eminently opportune for bringing before the public mind those causes which are destined to have a most unbounded power in the future of the human family, and which will determine the proper *status* of the workingman and capitalist. In order to give my readers an insight into the progress of events which are daily transpiring in our midst, and also that they may see the views of deep-thinking, educated minds upon subjects which practically are rising into greater and greater importance each year, I will here copy, in part, the very able and interesting address of Hon. W. G. Moody, of Boston, Massachusetts, read at the fourth yearly meeting of the "Social Science Association," June 16, 1878, in Cincinnati.

This address, though long, contains much food for thought, when we recollect that every year the "army of tramps" is increasing, and the subject of "Communism" is looming into gigantic proportions, not only in Europe, but also in various parts of the United States. The views expressed by Mr. M. are his own, and though they may not agree with those of ourselves or the reader in every particular, yet are worthy of consideration, based, as they are, upon deep thought and reliable statistics. Without further preface, I will let this article end with Mr. Moody's essay, trusting that the serious attention of our people will be given to the subject:

"DISPLACEMENT OF LABOR BY IMPROVEMENTS IN MACHINERY.

"At the commencement of the present century very little labor-saving machinery was in use. Then the farmer's best plough was of wood, iron shod, drawn by from one to four or more yoke of oxen, one man to drive the team, another to hold the plough, and often another to keep it clear. Result, about one and one half acre ploughed per day, by say two men.

"Now are used ploughs in gangs of two or three or more, of polished steel, drawn by horses, controlled by one man, who rides at ease. Result, five or more acres per day ploughed by a single man, and much better than by our fathers. Or steam is used, with still greater results, ploughing an acre or more an hour.

"Our fathers sowed their seed by hand, taken from a bag slung from their shoulders. Now, a machine, controlled by any boy who can drive a single horse, will do more than three times the work in a given time, and far better. Similar changes have been made in all the preliminary processes of agriculture.

"When the grain was ripe for the harvest our farmers would go into the field with their sickles in their hands, and a long day of hard work would result in one-fourth of an acre of grain cut per man. Now, a man will take a reaping machine, drawn by one or two pairs of horses, and reap his twenty or more acres per day—one man now doing the work of eighty but about fifty years ago.

"In the case of the sickle the day of our fathers would exceed, rather than fall short of, fifteen hours. But I estimate upon ten hours for a work day.

"The reapers here referred to are those in common use in New England, and other places where the land is quite uneven, rough, or hilly, having cutters about five feet long; but for the great grain regions of the West, for the smooth, flat, or prairie lands of Illinois, and other sections in the Valley of the Mississippi, and in California, cutters are made and in common use of ten and twelve feet in length, some fifteen and eighteen, and even twenty-four feet long are used, cutting swaths of these widths; and proportionately is the reaping hastened and muscular labor displaced.

"Our fathers bound the wheat in sheaves after it was cut, and stored it in their barns for the winter's work for themselves, their boys, and their men servants, in threshing it with flails.

"Now, machines are sent into the field which gather it up, pile it in great heaps, where it is taken by other machines, and in a few hours, or a few days at most, it is threshed, winnowed, sacked, and ready for market.

"But in California machines are made and used which, at one and the same time, in moving over the field, cut the grain, thresh, winnow, and sack it, and the filled sacks are left in rows where, but a few moments before, stood the golden grain untouched, inviting to its harvest.

"For our great corn crop the corn-planter is used, as is the seed-sower for smaller grain. Then, instead of using the hoe, as did our fathers in working their corn, where a man found a hard and long day's work in hoeing half an acre, a man or a boy will now seat himself upon a cultivator, with a pair of horses before him, and work one acre an hour; one man now doing with this machine as much as could be done by twenty men with hoes. Please bear in mind, also, that the ploughing with our modern ploughs, and cultivating and working with our modern cultivators and harrows, so improves the condition of the ground as to make a marked increase in the crop. After the corn was harvested, our fathers would turn a shovel upside down over a box, sit on it, and drawing the ears of corn with force and vigor across its edge, shell twenty bushels in a long day; and hard work it was. Now, two men will take the ordinary improved corn-sheller, and shell twenty-four bushels in an hour, or two hundred and forty bushels in a short day. Leaving out of the account the difference in the length of the days worked, this shows that six times as much is now done with this machine as our fathers could do by the old methods. With the three classes of horse-power machines, two men will shell 1,500, 2,000, and 3,000 bushels respectively per day of ten hours; one man and machine now doing the work of 37½, 50, and 75 men respectively, without machinery.

"So, also, in our important hay crop, the machine mower is first put in, one man with team cutting as much grass as could twelve men with scythes; then follows the tedder with a man and horse to scatter and turn it, to facilitate its drying, doing the work of twenty men with the hand-fork, and so much better as to reduce the time between cutting and harvesting at least twenty-four hours. Then follows the horse-rake, raking twenty acres a day, while a man with the ordinary hand-rake can rake but two. Here the machine and man does the work of 12, 20, and 10 men respectively, with the old appliances.

"In all these operations in agriculture there is a displacement of labor by improvements in machinery of from one doing the work of three in sowing grain, to twelve and one half in ploughing, and three hundred and eighty-four in cutting grain at harvest, according to the kind of work done, and the class of machinery used for the particular operation.

"And machinery digs the potatoes, milks the cows, makes the butter and the cheese. There is now nothing in food production without its labor-saving process.

"Our fathers, with all their boys and men servants, had a full winter's work in threshing their wheat, shelling their corn, &c., and getting their small products to the mill or the market. Now, after machinery has done its work in the field and barn, the iron horse drags the product over its roads of steel for hundreds and thousands of miles, at less cost and in less time than it took our fathers to transport the same to distances not greater than fifty miles. Upon those roads where our fathers had hundreds and thousands of men and teams constantly employed in hauling products to market and goods to the country, nowhere now is a man or team so employed; men and animals are released from all that labor; new forces take up the work, guided and controlled by comparatively few minds and hands. Even our cattle and hogs are no longer required to walk to the shambles; the iron horse takes them to the butcher; labor-saving processes slaughter them, dress them, prepare their flesh for the market, for the table, and stop only at mastication, deglutition, and digestion.

"To-day, one man with the aid of machinery will produce as much food as could be produced by the naked muscle and tools of a score of our fathers. There is now no known limit to the power of its production. In consumption there is no corresponding increase. Our fathers required, obtained, and used as many ounces of food per day as we do. It might have been different in kind and quality—nothing more.

"Not long ago the farm found constant employment for all the sons of the farm, and many of the children of the city. Now, the farm furnishes employment for but a very small number of its sons, and that for a very few weeks or months at most in the year, and for the rest work must be had in the cities and towns, or not at all.

"Here we find the true reason for the stagnation in the population of the older agricultural sections, and abnormal growth and crowding of the cities.

"In the time of our mothers they, with all their daughters, had an abundance of employment in their homes. Throughout our country every farm-house possessed its looms and spinning wheels. From the sheep reared upon the farm was the wool taken and carded by our mothers, ready for spinning. The flax grown upon the place was by our fathers broken and hackled by hand, and made ready for the women-folk, who, day after day, week after week, month in and month out, for fully or more than one half of the year, were all constantly employed in carding, in spinning, and in weaving the woolen and linen cloths that clothed the family, or were traded at the store for tea, and coffee, and sugar, or other necessaries or luxuries of life. The household music of that time was the hum of the large spinning-wheel, that rose and fell as the spinner receded or advanced, in concert with the more steady flow of the tones of the flax-wheel, as with foot on treadle other members of the family, or women servants, spun the flax which was changed to linen yarn or thread. At the same time the constantly repeated rattle of the shuttle could be heard as the dextrous hand sent it flying through the warp, to add another thread to the web, followed by the stroke of the swinging beam. These operations were in constant progress in all the farm-houses and a very large portion of the town houses.

"The never-ending labor of our grandmothers must not be forgotten, who with nimble needle knit our stockings and mittens. The knitting-needle was in as constant play as their tongues, whose music ceased only under the power of sleep. All, from the youngest to the oldest, were abundantly employed, and all decently clothed.

"Now, all is changed. Throughout the length and breadth of our land the hand-card, the spinning-wheel, and the hand-loom are to be found only as articles without use, kept as curiosities of a past age.

"Now, the carding machine, machine spindles, and power looms have taken their places, and the labor of one pair of hands, guiding and controlling machinery, turns out a hundred yards of cloth where but one yard was produced by our mothers.

"The occupation of our grandmothers, also, is gone; no more does the knitting-needle keep time to the music of their tongues. The knitting machine, in the hands of one little girl, will do more work than fifty grandmothers with their needles.

"The consequence is, there is no work at home for our farmers' daughters; they, also, must seek the towns and cities, where they find their sisters equally idle, and in thousands are found upon the streets spinning yarns and weaving webs, the warp of which is not of wool, neither is the woof of linen.

"So the sewing machine has been generally introduced, and where formerly all the sisterhood were expert seamstresses, now many hardly know the use of the needle; the machine relieves them of this labor also.

"Our fathers in building would begin at the stump, and with their hands work out all the processes of construction. With their whipsaws they would turn the logs into boards; they would hew the timber; rive and shave the shingles; dress and tongue and groove the flooring; dress and prepare all the lumber for doors, windows, and wainscoting; make the doors and windows, with their frames; work out moldings, ornaments, and finishing of all kinds. With their hands and feet they worked the clay for their bricks, and molded them by hand. A house carpenter then would, with his hands, from the forest build and finish a house from sill to ridgepole, and was furnished with all the tools to do it with, many of which he also made.

"Now, all these various processes are wrought out by machinery. Machinery makes the bricks and saws the logs; the planing machine does the tonguing and grooving; the molding machine makes the molding; the doors, the windows, the blinds, the shingles—all, everything is done by machinery, and muscle is required only to put the parts together, and in their places. Machinery does nine tenths of the labor, and muscle the little remainder.

"We will note the work of some half dozen of the machines now in general use in building and carpentry. The circular saw, controlled by one man, will saw more in one hour than can be done in ten hours with a handsaw; with the molding machine one man can work out more moldings than can ten men by hand; in planing, the planing machine, controlled by one man, will do the work of fifteen or twenty men with hand planes; in cutting mortises and making tenons, one man with a machine will do the work of ten men by the old methods; with a jig saw he will do the work of eight men with the old tools; and with the band saw will do the work of twelve men by the old methods. These facts show a general displacement of muscle by machinery of at least ninety per cent. in our great building interests.

"The Crispins of our father's time were thorough boot and shoemakers, and a numerous class. But now, after labor-saving processes have killed the ox and skinned him, and tanned his hide and dressed it, it does seem as if the leather was put in at one end of a machine, and at the other end is delivered a shower of boots and shoes, caught by girls and boys.

"Until within the last twenty years, all the watches worn in our country were of European hand-make, mostly English and Swiss—a business in those countries that employed thousands. But within the time mentioned, in Waltham, Massachusetts, and in Elgin, Illinois, two establishments commenced making machine watches, followed quite recently by some half dozen other establishments in other places; and now, in this country, there is substantially no more sale for hand-made watches. Swiss and English are alike knocked out of time; large communities in those countries are in great want, absolutely destitute, because of our machine movements. The hand watchmaker, also, must find other employment if he can.

"Even the graders of our towns, cities, and roads are displaced by machinery; the pick and shovel, wielded by brawny arms, until within a few years, were the only forces used Now the steam paddy displaces brawn; the pick and shovel are too costly and too slow. In San Francisco its hills, covering miles of territory, have been removed by labor-saving processes. The steam paddy, controlled by two men, digs down and removes the hills at the rate of two or three scoops to the car load, and then, in trains of a dozen or more cars, are run to and dumped into the bays and hollows to be filled, compelling thousands of muscular workmen, with their picks and shovels, horses and carts, to find other employment.

"Twenty-five years ago the miner in California and Australia washed his gold in a pan, or in a cradle, into which he had placed a couple of shovelsfull of earth, rocking the cradle with one hand and pouring in water with the other. Now, the gold miner conducts the water from some high point to a favorable position over his placer, giving a large fall, and from that position in hose to the washings, where, rushing with irresistible power through a small nozzle, it is turned against the solid hills of dirt, gravel, stone, and cement, which it cuts down, dissolves, and through sluices carries miles away to a favorable place for dumping, leaving the gold deposited in the sluice. In this manner, hills three and four hundred feet high, of the hardness of stone, melt and disappear like a bank of snow before the summer's sun; half a dozen men, by this labor-saving process, doing the work that would require an army with picks, shovels, and cradles only.

"Now, let us see what have been the general effects which have resulted from the use of labor-saving machinery. I will briefly sum them up in a few distinct conclusions.

"*First.* It has broken up and destroyed our whole system of agriculture as practiced by our fathers, which required the whole time and attention of all the sons of the farm, and many from the towns, in the never-ending duties of food production, and has driven them to the towns and cities to hunt for employment, or remain in great part idle.

"*Second.* It has broken up and destroyed our whole system of household and family manufactures, as done by our mothers, when all took part in the labor and shared in the product, to the comfort of all, and has compelled the daughters of our country and town to factory operations for ten to twelve hours a day, in the manufacture of a cloth they may not wear, though next to nakedness in the shivering blast; or to the city, to ply their needles for eighteen or twenty hours a day, in hunger and cold; or to the street in thousands, spinning yarns and weaving webs that become their shrouds.

"*Third.* It has broken up and destroyed our whole system of working in wood and iron and leather in small shops of one, two, or it may be half a dozen workmen, in every town, village, or hamlet in the country, with blacksmith shops in near neighborhood upon every road, where every man was a workman who could take the rough iron, or unshaped wood and uncut leather, and carry it through all its operations until a thoroughly finished article was produced, and has compelled all to production in large shops, where machinery has minutely divided all work, requiring only knowledge and strength enough to attend a machine that will heel shoes, or cut nails, or card wool, or spin yarn, or do some other small fraction of a complete whole.

"*Fourth.* It has broken up and destroyed our whole system of individual and independent action in production and manufacture, where any man who possessed a trade, by his own hands could at once make that trade his support and means of advancement, free of control by any other man, and has compelled all working men and women to a system of communal work, where, in hundreds and thousauds, they are forced to labor with no other interest in the work than is granted to them in the wages paid for so much toil; with no voice, no right, no interest in the product of their hands and brains, but subject to the uncontrolled interest and caprice of those who, too often, know no other motive than that of avarice.

"*Fifth.* It has so enormously developed the power of production as to far outstrip man's utmost power of consumption, enabling less than one half of the producing and working classes, working ten hours a day, to produce vastly more than a market can be found for; filling our granaries, warehouses, depots, and stores with enormous amounts of products of every description, for which there is no sale, though never before offered at such low prices, with multitudes of men and women in the greatest want—being without food, clothing, or shelter—without work, and, consequently, without means to obtain the simplest necessaries of life.

"*Sixth.* It has thrown out of employment, substantially, one half of the working classes. In fact, it has utterly destroyed all regular or constant employment for any considerable class in any industry, and is constantly and steadily displacing able and willing men, and filling their places with women and children—leaving no place to be filled by, and no demand for, the constantly increasing numbers developed in our increase of population; in this way, also, rapidly adding to the number of the unemployed. It takes married women in thousands from their maternal cares and duties; and children, but little more than infants, from the schools, putting them to the care of machinery and its work, until quite one third of the machine tenders in our country are women and children: thus breaking down the mothers, slaughtering the infants, and giving employment to any who obtain it only upon such conditions of uncertainty, insecurity, competition with the workless, and steady reduction in wages, as creates a constant struggle to obtain the little work they do have, and get such compensation for it as will barely support life even when in health.

"These points show clearly the changes that have taken place in all our industries within a period of little more than half a century—changes greater than the world has before known during its whole existence.

"Real estate has depreciated quite one half, with everything still falling, and bankruptcies more frequent than ever; with wages and salaries still dropping lower and lower, and the unemployed class becoming greater and greater. Yet notwithstanding so many factories and mills stop producing, or run upon short time, stocks of products do but little diminish, and the market is not materially relieved.

"Why is it? Let us see if we cannot find the true reason.

"Our whole system of production and manufacture is now established upon the principle of producing for a market. Not, as were the agriculture and household manufactures of our fathers—for home and domestic use first, last, and always—only exchanging a small part for that which could not be produced at home. But now all work is concentrated into great producing establishments, under the influence and control of organized capital, for the sole purpose of finding a market and making a profit. Unconsciously recognizing the fact that the great market is in the million, who are the great body of consumers, the great mass of our products are adapted to the use of the million. As witness our huge textile manufactures; not one mill in the whole lot is run to produce goods solely to meet the demands of the millionaires—of the rich—but they all produce for the million; the use and demands of the millionaires are but incidents in the trade. Stop the consumption and trade of the millionaires, a small percentage only is lost; but stop the consumption and trade of the million, at once the whole textile interest is dead, carrying to destruction the millionaires who live upon it, with all its ramifications, running back to the growing of the cotton in the South, and of the wool, even to Australia or on the pampas of South America. Precisely the same facts obtain in the great boot and shoe interest, in the publishing interest, whether of books or papers; in agriculture, in transportation and travel, in everything. They are all sustained by the million, the great body of consumers, or not at all.

"Now, who are the million who sustain all these interests? Why, they are the workers in these very factories, mills, workshops, upon the farms, railroads, steamships, streets, highways, sewers, in our stores, counting-houses, pulpits, schools, colleges, everywhere, anywhere that wages are paid or salaries earned, aggregating at least nineteen-twentieths of our population; these are the million, of the most vital importance in trade and consumption in proportion to their numbers, and not in relation to their social rank.

"Machinery does nine tenths of the real work done in general production, and man but one tenth. Times have changed, and we had better change some of our old axiomatic saws, whether made by Poor Richard, or any other old saw-maker, for new ones, adapted to things as they are.

"Machinery produces, but man only still remains the consumer, and we may safely defy the inventor to find a substitute. Therefore, man now stands in at least the same favorable relation of importance to the manufacturer and producer as the cart horse does to the cartman. The cartman is dependent upon the condition of his horse for services. If the cart horse is in good condition, he will do good service; but if he is badly fed, poorly kept, out of order, and service is still required of him, not only will he not do the service, but his keeper is quite likely to have an account to settle with the Society for the Prevention of Cruelty to Animals. So, if the workingman is kept at work, well paid and in good condition, he will buy and consume liberally of all the products of our industries; but if he is not kept at work and well paid, he consumes little or nothing, his market is lost, he becomes valueless to society, and suffers great distress. Would it not be well to have a Society for the Prevention of Cruelty to Man, which should look after his employment and consequent ability to consume? It is man as a consumer that we must deal with in order to make our present system and object of production a success; and it is because we have not done so that we are in the midst of such great and general distress.

"Our engines and sugar mills, our cotton gins, our machine cards, spinners, looms, locomotives, saws, planers, watch machinery, telegraphs, telephones, presses, sewing machines, and shoe machines—in fact, everything we make for the purpose of saving labor, and possessing superior merit—are scattered all over the globe, with the skilled workmen to put them up and teach their use. The 300 locomotives recently built in Philadelphia for Russia, were sent home with scores of our engineers to put them up and teach the Muscovite their care and use; and the Lowell Machine Shop have orders from Russia for our improved machine spinners, &c., as is publicly reported. Hardly a bale of goods, or case of shoes, or any other product, leaves our ports for the foreign market unaccompanied by the machinery which produced them. The superiority of our machinery is generally understood abroad; and if they cannot build their own, they can buy from us, learn their use from us, and take our machines as patterns to build others by, and improve upon if they can. All the world outside of Yankeedom are not fools; they can learn as well as we can teach, and be sure they will improve upon our lessons.

"I cannot imagine a greater folly than that of those persons who expect that all the nations of the earth, or any one people on the globe, will permit us or others to do their munufacturing for them, or grow the food they eat. We have evidence of this in the greediness with which they are adopting labor-saving machinery, the anxiety that all exhibit to extend their own productions and manufactures, and the fierceness with which they all enter into the strife for what they also call foreign markets; and more than all, we see it in the enormous amount of idleness in all the countries of Europe, caused by the imperfect machinery they now have. Under these operations even old Spain, the very last country in Europe, I would have thought, to have suffered from this cause, is writhing in distress; the intelligence being, that in the district of Catalonia alone 119 factories have stopped, and 9,000 work people are thrown out of employment. And they also propose to find foreign markets for their products. Where? When they have obtained our new and improved machinery they may multiply the 119 and the 9,000 by at least three, and the resulting distress by any figure they please, and still fail to express it.

"The remedy must be general, not special.

"Relief we must have; the evils I have shown to exist are too great, too wide-spread, too rapidly developing and increasing in intensity, to be much longer borne. If relief is not found in peaceful and legal ways, it is sure to be found in violence. Already we have had symptons not to be mistaken, and they should be received as warnings. The distress with us is national, and the relief, to be effective, must also be national. No local action can possibly reach the case, and least of all local strikes. Strikes are in all ways bad things, rarely or never accomplishing the end desired, except at very great cost. Still there is very ancient and high precedent for even strikes, proving them not to be new inventions. No doubt you have all learned something of the old brickmakers' strike, some three thousand two hundred years ago, led by those two pestilent fellows, as no doubt thought their task-masters, named Moses and Aaron, instigated by that Being known as Jehovah. The narrative may be found in that old volume called the Bible, which I believe is still in print. That Being's ears are still open to the cry of distress, and He still avenges the wrongs of the oppressed, but in His own way, and His ways are not our ways. Therefore, I say relief must be found; and how?

"The process is by no means mysterious nor uncertain.

"The relief is to be found in the distribution of the work to be done among all who will take a part in it. Here is the point I have been approaching, and is the vital point in the whole discussion, that the only way in which the great idleness in our country can be remedied, and the enormous distress and crime resulting from that idleness can find relief, is in the distribution of the work to be done among all who will work. Instead of a system that at best gives but uncertain and transient employment to not more than one half of our workers, while the other half are practically idle, living God only knows how, divide the work so that every one can count, with reasonable certainty, upon constant, permanent employment, then the first great element of universal content and prosperity will be established.

"Do not misunderstand me. When I say constant, permanent employment, I do not mean that man shall work twenty-four hours every day, nor fifteen hours, nor ten hours, but that day by day he shall work for his daily bread; that for six days in every week he shall have work, and upon the seventh only he shall do no manner of work. That, in short, a normal day's work shall be established; the number of hours per day shall be fixed—no matter what that number may be—in which all, by working, shall produce abundantly for all. The standard for fixing that normal day, which must be flexible, must be the employment or non-employment of all who will work, and the consumption of all products—facts as easily ascertained as the market price of any product, and as easily regulated as the movements of a machine. Let these two elements of employment and consumption stand for the column of mercury in the industrial tube, with time for the regulator. When the column stands at 30, or above, all will be fair and prosperous; when it falls to 28, or below, be sure a storm approaches, and the thumbscrew of time must be shortened, or possibly lengthened, to meet the changing conditions. If it requires only one half of all the working classes, working ten hours a day, to produce enough for all, leaving the other half idle, then all working but five hours a day will produce an equal amount—still enough for all—and none will be idle. This principle is self-evident. In this way, and in this way only, can all the wage-receivers and salary-earners be taken out of idleness, be put to work, and made self-supporting—be made contributors to the general welfare and increase of capital.

"It is not the time worked that enters into trade and commerce that is eaten or worn, and which gives the profit or loss, but it is the product consumed. With our improved machinery we can produce at least five times, but we will say three times, as much in five hours as we could without the machinery in ten hours. Consequently, if five hours a day were fixed as the normal day's work, and that normal day should find work for all, there would be at least three times the production, three times the trade, and three times the opportunity for profit, than heretofore, always provided the product were consumed. As to the power of our millions to consume the additional products, if they can but obtain them, there can be no two opinions. Now the amount of consumption by the whole of the working classes, employed and unemployed, does not exceed, on an average, seventy cents a day. Do you think they would find any difficulty in consuming three times as much, $2 10 a day; or five times as much, $3 50 a day? and even more than that? I do not mean simply so many more dollars, but three, five, or more yards of cloth, of pounds of food, of rooms occupied, of miles traveled, of pews and seats filled, of lectures and concerts heard, of books, papers, and periodicals bought, and everything else which goes to make up and advance our civilization. Our whole trouble lies in the fact that they are not doing it now. There is not a producer, manufacturer, or trader in our country who does not know that our wages-earning, salary-receiving people would consume more than three times the present amount, if they only had the means to do so. The inevitable result of this increased consumption would be a largely increased production, trade, and price for everything, manufactures especially, and for food and raw products. This is just what capital and manufacturers need, and to the workman would be no hardship. General cheapness means general poverty. It is not cheap products that are needed, but the ability to buy and consume all products at remunerative prices. The increase in demand for labor that would set all at work would have the direct effect of increasing the rates of wages and salaries, and the combined effect of all these operations would be a vast increase in the volume of trade, into which capital would throw its drag-net, with the sure result of being well filled.

"It is very probable that this advance in prices would end what we please to call our foreign trade or market for the two to five per cent. of our products which we now export, but the compensation will be found in the two or three hundred per cent. or more increase in trade at home. But to obtain the tea, coffee, spices, &c., that we need from abroad, we could still make profitable exchanges.

"This state of affairs is demanded just as much by capital as by labor, and its success wholly depends upon making all of our own people consumers of the products of our machinery. Without their full consumption, 'self-operative' machinery is a curse; but making every man, woman, and child consumers to the extent of their capacity, would make machinery the greatest boon of civilization. But whether a blessing or a curse, machinery we have, and machinery we will continue to have, constantly increasing in development. We may as well try to turn back the wheels of time as to stop the device and use of machinery as the great force that supplants muscular labor in all the processes of production. Neither should it be stopped; it is the greatest of civilizers; it is the most potent lever that man can use to lift the savage and half civilized up to a plane where true Christian civilization can be firmly planted. All that is wanted is a social and political regulator that shall so control its movements as to make it the servant of man, not his master. Machinery is the force that will lift man out of slavery for a mere animal existence, and make the highest development possible; or it is the stone that will grind him to powder. The absolutely true interest of capital lies in the payment of the highest wages that can be used by working people in the consumption of products. Labor keeps nothing; it either consumes the whole in products, or returns the surplus to capital as a trust, and how unyieldingly that trust is sometimes kept we have had too much evidence.

"What is wanted is an intelligent, authoritative examination of the problem by a body having the power and will to go to the bottom of the whole question, and who, through our foreign agents and Consuls, can obtain all the facts as to the use and development of machinery abroad, and its effects on labor. If these things are not really true, as they now appear to be, the inquiry will at least have resulted in a negative benefit; we shall know of one thing which does not work injuriously, and have gained something in directing further search. But these things are true, and the story is not half told.

"This body must be a commission from the General Government, clothed with full powers. Such a commission can, in the time between its appointment and the meeting of the next Congress, collect all the data necessary to a correct conclusion, and upon information thus obtained intelligent action may be taken. If it be found that what I have presented is only a limited and imperfect (as all individual efforts must be), though generally correct showing of the real facts, the road to the remedy is very short, and entirely practicable. The people of these United States are possessed of all the means for obtaining a speedy, quiet, and legal remedy that will establish our prosperity upon a firmer foundation than ever before, and give the start in a new development far exceeding anything that has yet been known. In less than one year after it has been determined what is the matter, and what must be done, the whole tendency and current of our affairs may be changed, without shock or disaster to any interest, but with satisfaction and prosperity in all.

"The adoption of this remedy by us will necessarily compel its adoption by all other countries in the interest of their own governments and people. Our example would be irresistible. Our movement in self-advancement and self-protection would be more quickly imitated than has machinery been developed.

"To set this movement under way the people must take action, must organize, and by memorial appear before the Government at Washington, praying the appointment of the Commission required to examine into these matters.

"At the close of the reading of the paper, the following communication was handed to Mr. Moody:

"CINCINNATI, May 23, 1878.

"*W. G. Moody, Esq.:*

"DEAR SIR: Are you aware that in China and Japan the governments of those countries have no patent offices, nor allow of any manual labor-*destroying* machinery used by their people? If an individual makes a labor-saving machine, the governments purchase his right and put it away, and never let it go into operation. The object of those governments is to *make* labor for the people, and not to *destroy* labor by labor-*destroying* machinery. R. B."

HESSIAN FLY AND WHEAT MIDGE.

The wheat crop for the past year was seriously injured in Kentucky by these two pests. I will here give a history of the Hessian fly in our country, and suggest some thoughts to the farmer how to prevent the ravages of this insect. The Hessian fly is a *gnat* having only *two wings*, one on each side, not four wings or two "double wings," like most other flies. It belong to the genus "Cecidomyia," and order "Diptera," or "two winged," and bears the name "Cecidomyia Diptera destructor," on account of its injurious ravages upon all kinds of small grain, such as wheat, rye, barley, oats, and many kinds of grasses. It is very similar to the mosquito in appearance, though easily distinguished from this insect.

The common name, "Hessian fly," has been given this insect in America, from the fact that its first appearance in New York, New Jersey, and Pennsylvania, was about the time that the Hessian soldiers, under the command of Gen. Howe, were brought to the Colonies. The universal idea then was that the eggs, larvæ, or pupa of the fly were imported in the straw or hay used as beds and forage by these troops, which is doubtless the true theory of the origin of this pest among us.

The body of the fly is usually one tenth of an inch in length, and the wings, when expanded, one fourth of an inch. The antennæ, head, thorax, and forepart of the body are black, or nearly so, while the abdominal parts are tawny, with blackish bands or rings about each segment of the abdomen. The ovipositor or egg-tube in the female is pinkish in color. Fine greyish hairs cover most of the body. The wings are of a black color, narrow at the base, rounded at the tips, and fringed with fine fuzz or hair of a greyish color; the legs are brown and feet black. The antennæ are quite long, and divided in links or joints, which are fringed with short greyish fuzz or hair. The fly itself is perfectly innocent to plants, as much so as the mosquito, and while the insect is in that stage appears to be entirely addicted to pleasure, love, and marital obligations, and the females to depositing eggs. These eggs are deposited in countless numbers on the leaf or main stalks of the wheat, rye, or barley. They are too small to be seen by the natural eye. From these eggs the larvæ or maggots make their appearance in a few days, and work their way to the stalk, and become located beneath the culm or boot of the leaf, near a joint, and here they remain, head downwards, never moving from their position until their final transformation is completed. These larvæ at first are of a pale pink color, gradually becoming more pale and transparent as they grow older. In the larvæ state the insect feeds entirely by absorption from the plant. If several are on the same plant, this absorption will be so great as to give the plant a yellowish, sickly hue. The larvæ *never bore* or *cut into the stalk*, but remain quiet until they grow plump and firm in texture, which usually takes from four to six weeks, according to the temperature of the atmosphere. When the larvæ are fully grown they take on a tough, brownish-colored skin, which is very much like the skin or epidermis of a flaxseed, and they are then said by farmers to be in the "flaxseed state." This hard skin answers, like cocoons, as a protection or covering to the grub during winter, wherein the insect hibernates until it changes in early spring into the pupa or chrysalis. In this stage it has a lighter skin or covering, which gives protection while the chrysalis is preparing to emerge into the full-fledged fly, the former covering having been detached or cast off very much after the fashion of the mosquito in passing from its "wiggletail stage."

When the fly is matured, which in this climate is in March or early in April, it begins at once its labor of love, enjoyment, and preparations for the continuance of its species through the same egg-laying process. Within 10 to 20 days its mission is ended, and the eggs are again hatched, and in due time the larvæ is matured in the plants of wheat, barley, rye, or grass, and by the first of September to the first of October, there is the second brood of flies. Many farmers think there are three broods within the year, which I think is possible, when the spring is early and the fall late; but this may be only scattering individuals which "come out of season." When the period arrives for any female to deposit her eggs, she will first seek for wheat; if that cannot be found, then she seeks for rye, oats, barley, or some favorite species of grass, or even weeds, for she cannot defer the time of deposit beyond its period. These eggs are not deposited always on the bottom blades, but sometimes in such manner that the larvæ or grubs will be found on the second or even third joint; when this is the case, grazing of wheat destroys the grubs.

Having thus given a description of the life and habits of this fly, I will now suggest some ideas respecting the best modes of getting rid of its ravages upon the grain crops of the country.

The fall brood is the one from whence most of the devastation to wheat fields comes. Experience has proven that the best way to escape the larvæ is to sow the wheat *after the fly has deposited the eggs*, since the grub never removes from the plant on which the egg is deposited. The egg deposit in this latitude takes place usually about the first of October; so that wheat sown from the 10th to the 20th of October, rarely ever is affected by the grubs of the fly, except in very late, warm falls. In early sown wheat grazing with sheep will often be advantageous, because they nip the plant below the joints containing the larvæ, and thereby destroy the grubs. Another preventive is said to be the use of chemical fertilizers at seeding time, the odor of which partially drives off the fly. The summer brood of larvæ, which are frequently on the wheat stalks at harvest time, may be effectually destroyed by cutting the stubble high and immediately ploughing it under with a large three-horse plough, so that they will rot with the stubble; but if one farmer act thus, and his neighbors do not, they will supply him gratuitously with flies enough for a new stock in the fall, since it is known that the fly will migrate, and is also blown by winds and storms over large areas of country. It is too expensive to undertake to kill the larvæ by any kind of poisonous mixtures sprinkled or sown over the crops; besides, it is very doubtful whether the grub, when encased in his winter cocoon, can be injured by any mixture which would not be fatal to the plant. The fly when on the wing is easily blinded by fire at night, and might be destroyed in large numbers were fires made about the wheat fields the exact night when they lay their eggs; but this would be very difficult of practice. For many years, in the early part of this century, the Hessian fly was so destructive to crops in Pennsylvania and New Jersey that the farmers almost gave up seeding wheat at all. These insects have been known in their flight across the Delaware river, and in other sections of these States, to pass in such numbers as almost to obscure the rays of the sun; of late years, however, they have been comparatively harmless even in these States, which is attributable to the destruction of the eggs and larvæ and pupa by another fly or ichneumon insect, known as the "Ichneumon Hymenoptera," of which there are several species, all belonging to the same order and family. Some of these are so small that they can easily puncture and deposit their eggs in the eggs of the Hessian fly, though more generally in the larvæ or pupa, where they consume the grubs or chrysalis before they come to maturity.

The small insects are frequently mistaken by the farmer for the Hessian fly; but the distinction is easily made if the wings are examined, there being only two on the Hessian fly, and never less than four on any of the Ichneumonidæ. These little parasites, like the Ichneumonidæ that follow the potato bug, the tobacco worm, and various injurious grubs, catterpillars, and beetles, are the farmer's best friends, and are no doubt the main cause that prevents a total destruction of many of our staple crops by the numerous species of troublesome insects which prey upon them. Our main reliance to get rid of this great pest to the wheat, rye, and barley crops, then, is to depend on later sowing, chemical fertilizers, and our millions of little friends, the Ichneumonidæ.

Wheat Midge, the "Cecidomya tritici," is an entirely different insect from the "Hessian fly." This pest does not attack the wheat or other grain in the fall season, but they pierce the berry while in the bloom or milk state, and deposit their eggs, which are hatched out into the larvæ when conditions are favorable. This insect is not nearly so formidable to grain as the Hessian fly, and does but little injury except in warm, moist climates, or in wet, warm fall seasons.

HOG CHOLERA.

To define what is hog cholera would be next to impossible, owing to the multitudinous symptoms that prevail in different sections, and at different times, when hogs are dying with the disease. In writing to the Department of Agriculture from the State of Alabama, a correspondent, in describing what is there called hog cholera, says of the symptoms:

"It is principally confined to the mouth, throat, and lungs; but often affects the kidneys, occasioning copious discharges of bloody urine. In its first stages the mouth and tongue are much ulcerated, so that the hog cannot take usual food, being unable to masticate even a tender apple. Within three or four days a heavy coughing ensues, the lungs become badly ulcerated, and in many cases entirely consumed. At this stage great thirst prevails, and the hog will lie around near or in the water until death. In some cases they continue to live fifteen days without seeming to take any nourishment. In some localities 80 per cent. of all the hogs have died of this disease. It made its appearance here in July, and is still prevailing to a limited extent. It has thus far proved incurable."

This is evidently one phase of the disease that is frequently met with, not only in Alabama, but throughout the Southern and Western States.

One of the most common forms of the disease is thus described by a farmer of Illinois. He says the disease is new in his section, but precisely a similar disease has prevailed in Kentucky since 1856. He says:

"We have had among swine a disease new to us, which has taken many hogs of all ages, but is perhaps more prevalent among large fat hogs. The first symptom is a cough; in a short time they are troubled to breathe, and three out of four die within a period ranging from twenty-four hours to six days. On examination, after death, their lungs seem to be the only part diseased. In some cases one lung will be entirely gone, and the other swollen and hard, of a blue or purple color, and when cut into, a kind of yellow frothy matter springs out."

From post mortem examinations made by eminent microscopists and physicians, and reported to me, as well as from my own experience and examinations, I am convinced that the cause of hog cholera is beyond question *a poison* that is carried into the system by *microscopic animalcules.* These parasites are exceedingly small, and can only be seen when magnified from 500 to 1000 times. They float in the atmosphere, and are inhaled into the lungs, where they multiply by millions, and are absorbed through the tissues of the lung-cells into the blood, where their poisonous effects are produced. Sometimes, instead of the lungs showing signs of the disease, it will appear in the brain, in the liver, or in the kidneys, or in the stomach and smaller intestines; but this "skipping about" of the symptoms is doubtless caused from the predisposition of that particular organ or organs to disease at the moment, either through weakness or other complications. The insect which produces this disease is not indigenous to the United States, but, like a similar microscopic insect, which most probably produces cholera in the human system, came from Central Asia. The same insect (or one very similar) which produces chicken cholera in poultry, produces this disease in hogs. The first chicken cholera was introduced into the United States about the year 1855, when the Shanghai, Brahma, and Cochin China chickens were first imported. Soon after the chicken cholera made its appearance, hog cholera became common; and what is exceedingly strange, *rust in oats* made its appearance in the same year, a thing that was unheard of previous to that time. The hog and chicken cholera have never prevailed, up to this date, to a very great extent further eastward in the United States than Pennsylvania, nor north of 40° of north latitude—New England being apparently exempt from its ravages. The Department of Agriculture gives the following table of the number of hogs that have died from April 1, 1876, to April 1, 1877, in the districts affected by the disease:

STATES.	Per cent.	Number.	Value.
Virginia	4	24,296	$111,275 68
North Carolina	10	73,550	308,910 00
South Carolina	10	28,410	118,753 80
Georgia	10	148,310	532,432 90
Florida	20	33,320	90,630 40
Alabama	24	190,464	660,910 08
Mississippi	18	214,074	783,510 84
Louisiana	14	33,964	127,025 36
Texas	12	137,340	565,840 80
Arkansas	16	160,048	571,371 36
Tennessee	16	174,064	750,215 84
West Virginia	4	10,828	51,324 72
Kentucky	21	333,522	1,821,030 12
Ohio	7	122,899	930,345 43
Indiana	18.6	441,750	2,893,462 50
Illinois	22	605,000	4,840,000 00
Iowa	13.6	443,795	3,235,265 55
Missouri	30	768,000	4,185,600 00
Kansas	14	50,372	398,946 24
Nebraska	6	10,230	73,451 40
Total	....	4,004,236	$23,050,303 02

From this table it will be seen that the farmers of the United States lose annually over 4,000,000 of hogs by cholera, worth nearly $25,000,000. In human cholera, experience teaches us that stout, healthy persons are more subject to the disease than persons of a weakly or delicate organism. In hog cholera, in like manner, large fat hogs are more liable to the disease than the poor, thin hogs of the woods. We now frequently hear of persons who diagnose the disease, and prescribe cures and preventives, recommending cleanliness as a preventive and cure, some even going so far as to have the hogs subjected to cold water bathing when sick. I cannot see how the hog could have wallowed in his filthy habits, from the settlement of the Western continent, over three hundred years ago, and exposed himself to all the changes of weather and climate, unprotected through winter and summer, kept in good health all the time, and only recently has become so tender or delicate in his constitution or organism that he needs now watching and screening from wind and weather in order to maintain good health. My own experience, and that of most of my correspondents, is, that extra care of the hog, by housing and washing and forcing him to drink spring water, adds nothing to his health, and has, up to this day, never prevented a single one from taking the cholera, if he chance to inhale the microscopic insect that produces the disease. The same is true in regard to fowls, and probably also to man, not only in the disease of cholera, but any others of a malarial origin, whenever that malaria is borne through the atmosphere, and absorbed, with the parasites, into the bodies of the individuals, whether these malarial germs are microscopic animalcules or microscopic fungi.

The most observant physicians now know that small-pox, and nearly all eruptive diseases, that cholera, yellow fever, intermittent fever, croup, scarletina, typhoid fever, and hundreds of other diseases, which prove fatal to the human family, are caused by infinitessimally small parasites, just as similar parasites among animals produce quinsy and cholera in hogs, cholera and roup in fowls, and murrain, rinderpest, and Texas fever in cattle.

Remedies.—Almost everything has been tried by farmers, as well as by regular physicians, and, so far as reports have come to me, no case of hog cholera has been cured, except through the use of remedies that are by nature insecticides, such as turpentine, coal oil, coal cinders, carbolic acid, Crab Orchard salts, sulphur, calomel, iron, charcoal, copperas, potash, salt, alum, zinc, acetate of lead, and strong decoctions of insecticide plants, such as poke-root, henbane, peach leaves, persimmon leaves, witch hazel, mullen, tobacco, pennyroyal, milkweed, juniper berries, cotton seed, &c., &c.

One correspondent says: "Cholera has been raging ever since October. In some neighborhoods it has killed nearly all. One man lost all but 6 out of 170; another all but 1 out of 93. All the remedies applied have thus far failed to *cure;* but I believe that corn boiled in wood ashes or potash is a *preventive*. Once or twice a week I have fed my hogs on corn so prepared, and while my neighbors' hogs have died at a rapid rate, I have not lost a hog. The general loss is estimated at 50 per cent."

Another writer says: "My hogs have not been affected with the disease for years. I have given them warm soapsuds once or twice per week. Whether this has been a preventive I will not say; but the disease has prevailed in the herds of my neighbors."

More cures are reported from the use of coal oil, turpentine, Crab Orchard salts, alum, and copperas than from any remedies, although every article mentioned above comes highly spoken of by different correspondents, both as cures and preventives. The United States Congress appropriated *ten thousand dollars*, and appointed a commission to investigate the disease known as hog cholera, who are to report, if possible, cures and preventives; but this commission has not, at this writing, finished their labors. It is to be hoped that they may throw more light upon this as well as other kindred diseases.

Several hog-raisers upon an extensive scale, in different parts of the State, write me, that where coal cinders are fed to hogs they escape the cholera. Others recommend as a preventive to keep ashes, salt, and copperas dampened with coal oil, in troughs, where the hogs can partake of them every few weeks.

In giving medicine of any kind to a hog or other animal, care should be taken that enough is got into the stomach to have the desired effect. It frequently happens that medicines do no good on account of negligence in the administration of them—the object of medication being to destroy the miscroscopic animalcules in the lungs or in the blood. If any kind of insecticide medicine is kept in the troughs of water used by hogs or poultry, neither will ever be much troubled with cholera. Salt, ashes, sulphur, and copperas given occasionally to hogs (it is said), will clear them of lice, and also prevent the attacks of cholera. The leaves of the male persimmon, new peach tree leaves, witch hazel, pennyroyal, or ash leaves are reported to be excellent preventives to chicken cholera, if scattered about the nests and roosts. Crab Orchard salts in dough, and coal oil on corn, are reported very superior remedies for hog cholera, as is also a strong decoction of sulphur and alum. The prescriptions could be multiplied to any extent, but none of them have proven perfectly reliable in every case; and most of the patent panacea nostrums sold with certificates may be relied upon as *humbugs*. Let every farmer take good care of his stock, keep them in good order, and furnish them occasionally such insecticide remedies as nature indicates, when he sees his hogs biting pieces of wood or bits of stone-coal or charcoal cinders, and he may feel assured that he will not suffer serious loss from this much-dreaded disease.

EXPORT TRADE—WHEAT PRODUCTION.

The most marked feature of the civilization of this age is the facilities of trade or commerce, by which the necessaries or luxuries of life, which may be in excess of the demand in one country, can be conveyed to the citizens of another, and thereby keep up an equilibrium in the production and consumption of all things needful to man for food, raiment, or other uses. The constant and steady growth of the export trade of the United States during the last century has created a marked change in the productions of the civilized world. Particularly is this change noticeable within the last twenty-five years, and still more apparent when we consider the movements of the breadstuff crops of this country and Europe. Free trade in edible provisions of every-day use causes all breadstuffs to enter most civilized ports free of tariff impositions, thus utilizing the surplus of bread-producing countries by giving them an easy access to the mass of consumers in manufacturing States. This has caused a great diversity of labor in manufacturing countries, and a great reduction of wheat acreage. In the United Kingdom of Great Britain there has been a gradual narrowing of her wheat fields for the enlargement of her pasturage grounds, caused by the urgent demand for more live stock. This decline has averaged from 2 to 2½ per cent. per annum for ten years back, and shows a decrease in about twenty years of over twenty-five per cent. Meanwhile, her population and wealth has increased, and the demand for a larger supply of breadstuffs grows each year. There is a similar decline of wheat acreage, though less marked, in France, Germany, and the Austro-Hungarian Empire. In all of these countries, however, civilization is advancing, free thought and free actions are developing, all other industries have been flourishing, and trade relations have been extended and perfected.

Thus we see the conditions of wheat production are changing. Agricultural labor becomes scarcer and higher-priced as the countries advance in population and wealth, and all the elements of labor, land, &c., which enter into wheat or spelt production, are enhanced. In the meantime, the ever-growing population requires greater breadth of land for permanent pasturage for live stock, and correspondingly greater imports of breadstuffs for consumption. In the New England States and in the Middle States of our Union, this same enhancement is met with, and the production of cereals is forced back to the cheaper and more productive lands of the Ohio Valley and the trans-Mississippi departments. This state of things causes a steady and almost endless demand for the breadstuffs and provisions of the West by the Eastern parts of our own country and Europe, particularly by the British Islands. Of the European countries, the United Kingdom is by far the greatest consumer of foreign cereals. Her wheat imports each year show a steady increase. Twenty years ago they obtained most of their imported breadstuffs from Russia, Germany, and France. The United States then furnished less than 20 per cent. of these imports, while now we furnish over 45 per cent. of all the wheat and 40 per cent. of all the flour imported into Great Britain.

I mention these facts to show the current of our relations with the great grain-consuming country of the world, and our perfect ability to cope successfully with Eastern Europe in sending breadstuffs to the great manufacturing nations on her western coast. It is also evident that wheat culture, under a judicious system of fertilization, must go forward with us, and by the use of improved machinery and agricultural implements, that our farmers will, for ages to come, be the great feeders of Western Europe.

I am enabled to give, from the statistics of the Department of Agriculture, the following export tables:

Our exports of wheat and flour during the last fifty-one fiscal years were as follows:

FIVE YEARS ENDING—	Wheat.	Flour.	Wheat, including flour reduced.	Per cent. of flour in the total quantity.
	Bushels.	Barrels.	Bushels.	
1830	125,547	4,651,940	23,385,247	99.46
1835	614,145	5,241,964	26,823,965	97.2
1840	1,842,841	4,092,932	22,307,501	91.7
1845	2,946,861	6,274,697	34,320,346	91.1
1850	10,184,645	12,284,828	71,608,785	85.77
1855	16,446,955	13,149,518	82,194,545	79.9
1860	38,808,573	15,778,268	117,699,913	67
1865	138,306,907	19,757,733	237,095,572	42.09
1870	81,808,364	11,454,785	139,082,289	41.2
1875	224,019,376	16,797,684	308,007,796	27.2
Total for fifty years	515,104,214	109,484,349	1,062,525,959	51.5
1876	55,073,122	3,935,512	74,750,682	26.32

Our exports of maize have assumed great importance within the last few years. The following table shows the quality and value of our exports during the last fifty-one years by semi-decades:

FIVE YEARS ENDING—	Corn.			Corn Meal.		
	Bushels.	Aggregate value	Average value per bushel.	Barrels.	Aggregate value.	Average value per barrel.
1830	3,530,710	$2,019,926	$0 57.5	783,408	$2,404,371	$3 07
1835	2,568,946	1,801,711	70.1	817,383	2,731,077	3 34.1
1840	1,184,973	873,104	73.7	843,930	2,471,215	4 11.3
1845	3,474,109	1,755,602	50.5	1,132,749	2,037,021	2 68.1
1850	43,822,153	31,277,920	71.1	2,493,700	8,984,252	3 60.3
1855	23,905,196	17,712,699	74.1	1,121,456	4,147,318	3 69.8
1860	27,597,896	19,789,181	71.7	1,291,342	4,917,515	3 80.8
1865	52,612,028	34,903,365	66.3	1,176,607	5,323,270	4 52.4
1870	47,993,276	47,143,817	98.2	1,355,024	7,345,448	5 42
1875	146,152,915	104,464,944	71.5	1,604,053	6,461,588	4 02.8
Total 50 years.	352,842,202	$261,742,269	$0 74.2	12,619,652	$48,823,075	$3 87
1876	49,493,572	$33,265,280	$0 67.2	354,240	$1,305,027	$3 59.9

The "balance of trade" has been kept in our favor by the large exports of breadstuffs, the value of which is here exhibited:

VALUE OF WHEAT AND FLOUR EXPORTED.

FIVE YEARS ENDING—	Wheat.		Flour.		Wheat and flour reduced.		Per cent. of flour in total value.
	Aggregate value.	Average value per bushel.	Aggregate value.	Average value per barrel.	Aggregate value.	Average value per bushel.	
1830.	$112,754	$0 89.8	$24,708,090	$5 31.1	$24,820,844	$1 06.1	99.5
1835.	737,365	1 20	29,347,649	5 59.9	30,085,014	1 13.7	97.55
1840.	1,817,067	98.6	27,231,952	6 65.3	29,049,019	1 30.2	93.7
1845.	2,900,785	98.4	31,056,156	4 94.9	33,956,941	98.8	91.5
1850.	12,801,093	1 25.7	69,375,741	5 64.7	82,176,834	1 18.8	84.4
1855.	21,864,762	1 32.9	75,775,220	5 76.2	97,639,982	1 18.8	77.6
1860.	53,343,918	1 37.4	104,368,446	6 61.5	157,712,364	1 34	66.2
1865.	178,470,444	1 29	133,356,875	6·74.8	311,827,319	1 31.6	42.8
1870.	117,527,424	1 43.7	92,071,717	8 03.9	209,599,141	1 50.8	43.9
1875.	295,540,060	1 32.2	114,401,066	6 86.9	410,941,126	1 33.2	27.8
Total 50 y'rs .	$686,115,672	$1 33.1	$701,692,912	$6 40.9	$1,387,808,584	$1 30 6	50.6
1876.	$68,382,899	$1 24.1	$24,433,470	$6 20.9	$92,816,369	$1 24.2	26.32

Wheat still continues to lead in our exports of cereals, and probably will do so many years to come, although maize is rapidly coming into notice as an article of prime importance among our exports. Now we export yearly about 25 per cent. of the estimated wheat crop of the country, while 25 years ago we did not export over 10 per cent. Of other cereals our exports are not so important, except maize, as will be exhibited by the following table:

PROPORTIONS OF THE DIFFERENT GRAINS IN EACH ANNUAL EXPORT OF THE LAST THIRTEEN FISCAL YEARS.

FISCAL YEARS.	Wheat and Flour.		Corn and Meal.		Rye and Flour.		Oats.		Barley.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
1863–'64	87.9	91.60	10.91	6.34	0.4	0.26	0.65	0.37	0.14	0.13
1864–'65	84.77	89.10	13.33	9.79	0.48	0.31	1.18	0.48	0.16	0.21
1865–'66	50.45	66.27	44.25	30.81	1.48	1.1	3.81	1.77	. . .	. . .
1866–'67	42.55	54.61	53.92	43.49	0.74	0.65	2.77	1.23	. . .	. . .
1867–'68	66.63	75.92	31.45	22.51	1.37	1.39	0.31	0.16	0.02	0.02
1868–'69	76.92	82.88	21.45	16.23	0.22	0.2	1.25	0.6	0.15	0.12
1869–'70	95.21	96.25	3.78	3.00	0.36	0.3	0.21	0.11	0.45	0.24
1870–'71	82.38	88.75	16.73	10.78	0.13	0.11	0.23	0.10	0.53	0.30
1871–'72	51.37	68.5	47.07	30.35	1.09	0.75	0.34	0.16	0.11	0.08
1872–'73	55.35	72.84	42.73	25.98	0.65	0.53	0.76	0.30	0.51	0.35
1873–'74	70.12	81.9	27.49	16.48	1.42	1.22	0.62	0.24	0.24	0.16
1874–'75	70.25	75.96	28.90	23.47	0.19	0.23	0.38	0.26	0.09	0.05
1875–'76	58.31	71.93	39.76	26.86	0.45	0.42	1.14	0.45	0.20	0.16

Kentucky stands far down in the list of wheat-growing States, not that our lands are inferior to those of other States for the growth of wheat, but because our people are more closely engaged in the production of tobacco, hemp, and live stock. While Nebraska, Iowa, Michigan, Illinois, Indiana, Wisconsin, Minnesota, Missouri, and Kansas produce crops each year varying from 12,000,000 to 30,000,000, and sometimes over, Kentucky has never reported a crop exceeding 8,000,000 of bushels; yet the production of wheat with us is steadily on the increase, and with the use of chemical fertilizers our crop will probably improve from 8 to 10 per cent. per annum from now until we take our true position among the wheat-growing States of the West. Cars are now loaded, at various railroad stations in our State, with wheat and flour, consigned directly through New York or Boston to Liverpool and London; and this trade is becoming so well regulated that wheat and corn have become as reliable money staples as any others produced in our country.

I will close this article by giving the statisticians' tables of agricultural exports for the entire country for the years 1875–'6, and a recapitulation of the same from the year 1871 to 1876, inclusive.

AGRICULTURAL EXPORTS.

Statement of the exports of Agricultural Products of the United States, with their immediate manufactures, for the two fiscal years ending June 30, 1876, *compiled from the Reports of the Bureau of Statistics of the Treasury.*

PRODUCTS.		1875.		1876.	
		Quantity.	Value.	Quantity.	Value.
Animals, living:					
Hogs	number	64,979	$739,215	68,044	$670,042
Horned cattle	do.	57,211	1,103,085	51,593	1,110,703
Horses	do.	3,220	242,031	2,030	234,964
Mules	do.	2,802	356,828	1,784	224,860
Sheep	do.	124,416	183,898	110,312	171,101
All other and fowls			47,448		24,617
Animal matter:					
Bone black, ivory black, &c	pounds	1,598,888	74,648	686,635	29,271
Bones and bone dust	cwt.	71,376	132,246	40,432	69,159
Candles	pounds	1,605,332	236,676	1,513,475	229,311
Furs and fur-skins			4,396,424		4,398,883
Glue		131,244	22,745	24,288	5,798
Hair—					
Unmanufactured			429,598		310,761
Manufactures of			19,278		6,254
Hides and skins other than furs			4,729,725		2,905,921
Leather—					
Sorts not specified	pounds	24,154,193	6,286,397	31,947,001	8,394,580
Morocco and other fine			335,086		948,980
Boots and shoes	pairs	293,051	429,363	263,508	368,633
Saddlery and harness			74,102		87,730
Other manufactures			199,848		209,062
Oil—					
Lard	gallons	146,594	147,384	146,323	149,156
Other animal	do.	12,136	12,515	22,631	24,498

Provisions:					
Bacon and hams	pounds	250,286,549	28,612,613	327,730,172	39,664,456
Beef	do.	48,243,251	4,197,956	36,596,150	3,186,304
Butter	do	6,360,827	1,506,996	4,644,894	1,109,496
Cheese	do.	101,010,853	13,659,603	97,676,264	12,270,083
Condensed milk			123,565		118,549
Eggs	dozen	34,119	8,743	29,033	8,300
Lard	pounds	166,869,393	22,900,522	168,405,839	22,429,485
Pork	do.	56,152,331	5,671,495	54,195,118	5,744,022
Preserved meats			735,112		998,052
Soap:					
Perfumed and toilet			16,233		11,007
All other	pounds	10,167,655	677,258	10,057,478	673,732
Tallow	do.	65,461,619	5,692,619	72,432,775	6,734,378
Wax	do.	353,425	96,578	218,610	69,127
Wool:					
Raw and fleece	do.	178,034	62,754	104,768	13,845
Manufactures of			154,401		336,389
Total value of animals and animal products			$104,314,988		$113,941,509
Breadstuffs and their Preparations:					
Barley	bushels	91,118	$61,408	317,781	$210,584
Bread and biscuit	pounds	11,729,460	610,092	12,066,469	632,580
Corn	bushels	28,858,420	24,456,937	49,493,572	33,265,280
Corn meal	barrels	291,654	1,290,533	354,240	1,305,027
Oats	bushels	504.770	290,537	1,466,228	588,583
Rye	do.	207,100	204,590	543,841	480,083
Rye flour	barrels	9,993	54,964	7,553	39,054
Wheat	bushels	53,047,177	59,607,863	55,073,122	68,382,899
Wheat flour	barrels	3,973,128	23,712,440	3,935,512	24,433,470
Other small grain and pulse			804,193		1,136,515
Other preparations of grain			364,708		707,478
Rice		277,377	19,831	439,991	30,918
Total breadstuffs			$111,478,096		$131,212,471
Cotton and its Manufactures:					
Sea Island	pounds	4,439,120	$1,538.769	2,644,791	$941,803
Other unmanufactured	do.	1,255,979,783	189,099,856	1,488,760,543	191,717,459

Statement of the Exports of Agricultural Products, &c.—Continued.

PRODUCTS.		1875.		1876.	
		Quantity.	Value.	Quantity.	Value.
Cotton and its Manufactures—Continued:					
Colored goods	yards.	7,593,723	$939,061	16,488,214	$1,455,462
Uncolored goods	do.	21,224,020	2,313,270	59,319,267	5,314,738
All other manufactures			819,551		952,778
Total cotton, &c.			$194,710,507		$200,382,240
Wood and its Products:					
Boards, planks, joists, &c.	M feet.	213,974	$3,693,909	252,427	$3,862,793
Laths, palings, pickets, &c.	M.	6,777	22,535	5,675	16,501
Shingles	M.	40,628	160,925	33,636	180,847
Box shooks			471,942		105,796
Other staves and headings			5,239,329		4,322,252
Hogsheads and barrels	number.	202,879	459,085	152,228	349,456
All other lumber			235,984		321,790
Fire-wood	cords.	1,973	8,023	3,032	9,029
Hop, hoop, and telegraph poles			556,450		476,312
Logs, masts, and other whole timber			572,801		616,197
Timber sawed or hewn	cubic feet.	13,553,714	2,357,842	21,786,414	3,463,352
All other timber			366,975		138,553
Household furniture			1,711,769		1,574,935
Wooden ware			342,815		342,860
Other manufactures			1,539,701		1,565,602
Ashes, pot and pearl	pounds.	1,726,624	115,622	1,309,861	75,597
Bark for tanning			193,938		223,276
Rosin and turpentine	barrels.	937,527	2,774,419	824,256	2,188,623
Spirits of turpentine	gallons.	5,599,624	1,924,544	5,178,934	1,672,068
Tar and pitch	barrels.	54,905	127,206	69,138	164,647
Total wood, &c.			$22,875,814		$21,620,486

Miscellaneous:					
Brooms, brushes, &c.		. . . .	$146,988	. . . .	$198,914
Cordage, ropes, &c.	pounds.	3,035,241	391,165	2,126,524	271,090
Fruits—					
Apples. green, ripe, or dried	pounds.	4,813,270	1,048,440	891,138	289,679
Other green, ripe, or dried		. . . .	269,632	. . . .	210,177
Preserved in cans &c.		. . . .	315,931	. . . .	327,422
Ginseng	pounds.	497,487	658,926	550,624	646,954
Hay	tons.	7,183	110,225	7,528	134,017
Hemp—					
Unmanufactured	cwt.	2,140	21,856	870	8,318
Cordage, cables, &c.	do.	11,133	171,196	11,200	147,009
Other manufactures		. . . .	706,309	. . . .	737,042
Hops	pounds.	3,066,703	1,286,501	9,191,589	1,384,521
Liquors, alcoholic—					
Beer, ale, porter, and cider—					
In bottles	dozen.	3,633	7,600	7,045	13,007
In casks	gallons.	61,661	16,604	99,310	29,657
Spirits distilled from—					
Grain	gallons.	130,460	140,519	130,381	93,666
Molasses	do.	414,564	210,169	1,088,133	457,259
Other materials	do.	219	666	264	766
Wine	gallons.	45,039	50,308	31,915	33,483
Oil-cake	pounds.	247,016,095	5,138,300	287,119,800	5,774,585
Oil—					
Cotton seed	gallons.	417,387	216,640	281,054	146,135
Linseed	do.	32,370	30,689	30,331	23,770
Essential or volatile		. . . .	217,576	. . . .	248,270
Seeds—					
Cotton	pounds.	5,316,113	63,128	5,164,546	69,005
Flax or lint	bushels.	43	137	98	257
All other		. . . .	1,227,750	. . . .	1,348,750
Starch	pounds.	7,382,862	442,682	9,685,552	524,956
Sugar—					
Brown	pounds.	362,552	31,111	22,714	2,354
Refined	do.	23,789,836	2,585,382	51,840,977	5,552,587
Molasses	gallons.	3,575,980	1,135,995	4,408,412	1,158,585
Candy and confectionery		. . . .	41,029	. . . .	32,245
Tobacco—					
Leaf	pounds.	223,901,913	25,241,549	218,310,265	22,737,383

Statement of the Exports of Agricultural Products, &c.—Continued.

PRODUCTS.	1875.		1876.	
	Quantity.	Value.	Quantity.	Value.
Miscellaneous—Continued:				
Tobacco—Continued—				
Cigars . . . . . M.	336	$17,072	707	$23,407
Snuff . . . . . pounds.	21,894	7,570	10,551	4,793
Other manufactures	. . . .	2,578,279	. . . .	2,804,955
Vegetables and their preparations—				
Onions . . . . . bushels.	47,695	51,259	61,816	54,015
Pickles and sauces	. . . .	18,865	. . . .	19,086
Potatoes . . . . . bushels.	609,642	522,182	704,379	431,443
All other	. . . .	169,425	. . . .	133,272
Vinegar . . . . . gallons.	16,345	4,756	19,325	6,133
Total miscellaneous	. . . .	$42,594,411	. . . .	$46,079,567

RECAPITULATION.

	1871.	1872.	1873.	1874.	1875.	1876.
Animals and animal matter	$47,010,312	$77,060,849	$99,806,599	$99,607,669	$104,314,988	$113,941,509
Breadstuffs, &c.	79,519,387	85,155,523	98,762,891	161,225,939	111,478,096	131,212,471
Cotton, &c.	221,885,245	182,988,925	230,190,597	214,319,420	194,710,507	200,382,240
Wood, &c.	15,820,029	21,425,068	25,854,120	27,675,300	22,875,814	21,620,486
Miscellaneous	33,060,081	40,139,296	37,901,458	45,486,626	45,294,411	46,079,567
Total agricultural exports	$397,304,054	$406,769,661	$492,515,665	$548,314,954	$478,673,816	$513,236,273
Total exports	562,518,651	549,219,718	649,132,561	693,039,066	643,094,767	644,956,406
Per cent. of agricultural matter	70	74	76	79	74	79

Our agricultural exports were nearly 80 per cent. in value of the total domestic exports, against 74 per cent. in 1875. Their actual increase in value was $37,542,438, or nearly 8 per cent., while the total domestic export increased only $1,861,439, or less than one third of 1 per cent. An increase is noted in all the leading branches, except wood and its products, which fell off about 6 per cent. Animal matter increased over 9 per cent., though living animals fell off considerably. Bacon, hams, leather, and tallow show an increase of over $12,000,000, while beef, butter, and cheese declined about $2,000,000. Breadstuffs increased nearly $20,000,000, the leading items of increase being nearly $9,000,000 in corn and corn meal, and $9,500,000 in wheat and flour. Oats, rye, and rye flour fell off nearly half, amounting to but little over a half million of dollars. Barley, always a small export, shows a considerable increase. Raw cotton barely held its own, while manufactures of cotton nearly doubled in value. The export of uncolored goods rose from 21,224,020 yards in 1875 to 59,319,267 yards in 1876; the aggregate value from $2,313,270 to $5,314,738. Miscellaneous matter increased about 9 per cent. The leading items of increase are found in hops, distilled spirits, oil-cake, seeds, starch, refined sugar, and manufactures of hemp and tobacco. Cordage, fruits, brown sugar, tobacco leaf, and vegetables show a decline.

Comparing the figures of the six years embraced in the recapitulation above, we find that the proportion of agricultural matter to the total domestic export has gradually risen from 70 per cent. in 1871 to nearly 80 per cent. in 1876, with a decline to 74 per cent. in 1875; but after deducting the precious metals, the proportion will be found to be uniformly about five sixths of the remainder; animal matter rose from less than 12 per cent. of the agricultural export in 1871 to over 22 per cent. in 1876; breadstuffs from 20 to 25½ per cent., reaching in 1874 nearly 30 per cent.; cotton fell from about 60 per cent. to 39 per cent.; wood, with its products, has ranged between 4 and 5⅓ per cent.; miscellaneous matter, between 7½ per cent. and 10 per cent.

FISH CULTURE IN KENTUCKY.

It is strange that those nations which we have been taught by missionaries, story writers, and geographers to look upon as semi-barbarous heathens, in our younger days, have really advanced farther inm any of the arts and sciences, particularly in those which give food, clothing, and peaceful employment to man, than we have in the much-boasting Christian countries of Europe and America. We probably rank our civilization highest, because we have farther-shooting cannons, and more improved needle-guns, and can kill more of our fellow-men at a greater distance, or in less time; or else because we can print more books, use more profane language, and invent more complicated systems of trade, by which riches can be taken from the laboring many and concentrated into the coffers of the skillful few. Be this as it may, recent investigations have shown us that the ancient Chinese and Japanese people far excel us in working the earth, so as to obtain double the amount of food for man from the acre that we do in America, and also that, for thousands of years, these people have skillfully and scientifically used chemical or mixed mineral and animal fertilizers, in such manner as to prevent entirely the wearing out of their soil; that now, a field in those nations which has been in uninterrupted cultivation for four or five thousand years, is richer and more productive to-day than it was when King Solomon built his temple, or Lycurgus ruled in Greece.

These same people, for thousands of years, have practiced the system of "fertilizing" their rivers, lakes, and streams, making them productive as they have their lands, so as to force their production of the largest amount of food for man. It is a noted fact that "fish hatcheries" and fish propagation have been for centuries, if not for thousands of years, a common mode of producing food in both China and Japan, although this industry was never thought of, invented, or practiced in Europe or America until within the last few years. Latterly, however (thanks to the hints we pick up from these heathens), all the civilized countries in Europe and America are progressing more in practical useful knowledge, in the ways of supplying food, both from the lands and the waters, for our ever-increasing population. This is as it should be, and certainly ought to call into requisition all the skill, science, and energy of our Caucasian race to make equal, if not to excel, in practical usages those industries that bring food, raiment, longevity, pleasure, and happiness to mankind.

Probably there is no kind of food that is more palatable, healthy, and cheap than fish, and none that can be supplied in greater abundance. In various countries in Europe, as well as in several of the States of our Union, "fish hatcheries" have been established, at which it has been proven, beyond controversy, that 95 per cent. in every hundred of the eggs of most kinds of fish can be taken by manipulation from the female at the proper season, impregnated by the milt of the male, also by manipulation, and hatched out, fed, and protected, so as to become the best of fry. The entire process is simple and easily accomplished. Books have been written by several parties giving details of the entire operation, from catching the parent fish to "planting" the fry in the different streams or lakes, where they are to receive their growth. Several such books have been written in the United States, one by Hon. Seth Green, of Rochester, New York (who is the Fish Commissioner of that State), in which all needful information and statistics are given upon the subject. A very comprehensive pamphlet was also written and distributed free throughout Kentucky, by Pack Thomas, Esq., first President of the Fish Commission in Kentucky, in the year 1866. This pamphlet gave all necessary information regarding "fish hatcheries," and how to preserve the fry after they were planted in the creeks, rivers, lakes or ponds. It is to be regretted that this valuable pamphlet could not have been stereotyped, so that every year other copies might be sent over the State. In it are given plates and figures, explanatory of everything necessary to be done, so simply and clearly demonstrated that any ordinary farmer could conduct a fish hatchery of his own, provided he had a spring of clear pure water. It is much easier to raise fish than it is to raise either hogs, sheep, cattle, or poultry. There are hundreds of streams, large and small, in this State, that might be made to supply more food in fish for man's use than the same number of acres of land can do when cultivated in the cereals, or devoted to live stock. The cash value of the fish consumed in the one city of Louisville, in this State, is over *a quarter of a million dollars annually*, not 5 per cent. of which probably comes from our own waters.

The Legislature of the State of Kentucky, in 1876, created a board called the "Fish Commissioners," consisting of ten members, one from each Congressional District, who are empowered to establish hatching-houses, and do such other things as may be necessary to stock the waters of the State with the best known qualities of fish. This Commission, under the presidency of Pack Thomas, Esq., of Louisville, proceeded to establish a hatchery in Jefferson county, and to procure an experienced man to attend to hatching and raising spawn, with which to stock our various rivers, &c., so far as could be done with the limited appropriation of $3,000 made by the Legislature. Mr. Thomas visited several of the best hatcheries in the United States, and became thoroughly posted in regard to the business, and wrote out full instructions concerning it, which were distributed through the pamphlet before mentioned. The law creating the Fish Commission made stringent rules against seining, fish-traps, and putting fish-berries, or other poisons, in the creeks and rivers for the purpose of taking fish, which rules the Commissioners are empowered to have enforced under heavy penalties to the offenders. In order that these laws may be effective, the residents on streams everywhere should see that no interference, by evil-minded or selfish persons, is permitted, particularly at or near the mouths of streams, for the entire stream may be rendered valueless for fish if the spawn are not allowed free passage *in* and *out* of it. A few men, says Mr. Thomas, who are disposed to disregard the law, may, with little cost or labor, render fruitless the best efforts of the Commission to stock a stream with the choice varieties of fish, if they are allowed to use berries, nets, or fish-dams. About twenty-five to thirty of the States now have Fish Commissioners looking to re-stocking their waters on an extensive scale, and this entirely by artificial propagation. The results in all these States have been, so far, most satisfactory, and the plan pursued has become so perfect that now over 95 per cent. out of 100 spawn has been hatched and safely planted in the intended streams.

The Commissioners placed fish as follows in 1876–'7:

Table of the Distribution of Young California Salmon by the Fish Commission of Kentucky.

Date.	Name of Stream where Deposited.	Tributary to.	Tributary to.	County.	Number.
1876.					
Nov. 27.	Floyd's Fork	Salt river	Ohio river	Jefferson	1,500
Dec. 7.	Clear, Mulberry, and Gist creeks	Salt river	Ohio river	Shelby	2,000
" 14.	Middle creek	Nolin creek	Green river	Hardin	2,000
" 14.	Bumgartner's creek		Green river	Hart	1,000
" 20.	Russell creek		Green river	Adair	1,000
" 20.	Dick's river		Kentucky river	Boyle	1,000
" 20.	White Oak creek	Dick's river	Kentucky river	Garrard	1,000
" 20.	Silver and Otter creeks		Kentucky river	Madison	1,000
" 20.	Hanging Fork	Dick's river	Kentucky river	Lincoln	1,000
" 20.	Green river		Ohio river	Casey	1,000
" 20.	Dick's river		Kentucky river	Lincoln	1,000
" 20.	Small streams	Salt and Chaplin	Ohio river	Mercer	1,000
" 27.	Dunlap's branch		Kentucky river	Woodford	1,000
" 27.	East and West Forks of Little Kentucky		Ohio river	Henry	500
" 27.	North and East Forks of Floyd's Fork	Salt river	Ohio river	Henry	500
" 27.	Lulbegrud creek	Red river	Kentucky river	Clark	1,000
" 27.	Howard's Upper creek		Kentucky river	Clark	
" 27.	Howard's Lower creek		Kentucky river	Clark	
" 27.	Stoner creek	Licking river	Ohio river	Clark	
" 27.	Strode's creek	Stoner creek	Licking river	Clark	
" 27.	Big Spring branch	North Elkhorn	Kentucky river	Scott	1,000
" 27.	Lane's Run, Cane Run, McConnell's Run	North Elkhorn	Kentucky river	Scott	
" 27.	Thomas' Spring branch	North Elkhorn	Kentucky river	Scott	
" 27.	Saunders' Spring branch	North Elkhorn	Kentucky river	Scott	
1877.					
Jan. 2.	North and East Fork of Rolling Fork	Salt river	Ohio river	Marion	1,000
" 2.	Pittman creek	Green river	Ohio river	Taylor	1,000
" 2.	Rolling Fork	Salt river	Ohio river	Nelson	1,000
" 10.	White Oak branch	Little Rockcastle	Cumberland river	Laurel	2,000
" 10.	Round Stone creek	Rockcastle river	Cumberland river	Rockcastle	2,000
" 10.	Hardin Durham's branch	Rockcastle river	Cumberland river	Rockcastle	2,000
" 28.	Booker's branch	Green river	Ohio river	Green	500
" 28.	Cave Spring branch	Green river	Ohio river	Green	500

Table of the Distribution of Young California Salmon by the Fish Commission of Kentucky—Continued.

Date.	Name of Stream where Deposited.	Tributary to.	Tributary to.	County.	Number.
1877.					
Feb. 1	Small streams	Green river	Ohio river	Fulton	2,000
'' 3	Knob creek	Salt river	Ohio river	Bullitt	1,000
'' 7	Spencer creek	Licking river	Ohio river	Montgomery	1,000
'' 7	Big Slate creek	Licking river	Ohio river	Montgomery	2,000
'' 7	Little Hinkston	Licking river	Ohio river	Montgomery	1,000
'' 7	South Elkhorn	Kentucky river	Ohio river	Woodford	1,000
'' 7	Small streams	Kentucky river	Ohio river	Franklin	200
'' 10	Pond at Central Kentucky Lunatic Asylum			Jefferson	25
'' 13	Barren river, at the Double Springs	Green river	Ohio river	Warren	3,000
'' 1	Eddy creek	Cumberland river	Ohio river	Caldwell	500
'' 1	Little river	Cumberland river	Ohio river	Trigg	500
'' 1	Hurricane creek	Ohio river	Ohio river	Crittenden	500
	Total				46,225

Record of the Distribution of White Shad in the Waters of Kentucky by the United States Commission of Fish and Fisheries.

Date.	Name of River where Deposited.	Tributary to.	County.	Number.
1877.				
June 1	Licking river	Ohio river	Bath	50,000
July 18	Green river	Ohio river	Hart	100,000
	Total			150,000

At the last session of the Legislature an appropriation of $3,000 was again made to continue the work of the Commission. Mr. Pack Thomas having resigned the presidency, Mr. Wm. Griffith, No. 66 Main street, Louisville, was appointed in his stead, and is now the active head of the Commission.

From the 30th of November, 1877, to July 1, 1878, there has been distributed by the Commission a large number of fry, as follows:

Distribution of Salmon Trout by the Fish Commission of Kentucky.

Date.	Name of Stream.	Tributary to.	County.	Number.
1878.				
April 11	Big Beech creek	Salt	Spencer	5,000
" 14	Clover creek	Ohio	Breckinridge	4,000
" 16	Logan's creek	Dick's	Lincoln	3,000
" 16	Neely's Run, Hungry Run, Dry Run, Chaplin creek, Sunfish creek, Buffalo creek, Stewart's and Town's creeks,	Salt	Nelson	7,000
" 16	Pitman creek	Cumberland	Pulaski	4,000
May 3	Pond		Franklin	800
" 8	Pond		Warren	500
" 8	Nolin creek	Green	Hardin	1,000
" 8	Rough creek	Green	Ohio	1,000
" 3	Small streams	Kentucky	Franklin	1,000
" 3	Pond		Woodford	500
" 13	Harrod's creek	Ohio	Jefferson	500
" 22	Slosser's lakes		Boone	500
" 22	Little Kentucky	Ohio	Trimble	1,000
" 22	Little Sandy	Ohio	Boyd	2,000
" 22	Kinniconick creek	Ohio	Lewis	1,000
" 29	Little river	Cumberland	Christian	2,000
" 29	Laurel creek	Green	Logan	1,000
June 5	White Oak creek	Dick's	Boyle	1,000
May 12	Big Bone & Gunpowder creeks,	Ohio	Boone	1,000
June 5	Chaplin river	Salt	Washington	1,000
" 12	Slate creek	Licking	Montgomery	2,000
" 12	Aaron's Run	Licking	Montgomery	2,000
" 12	Elkhorn creek	Kentucky	Scott	1,000
" 18	Doe Run	Ohio	Meade	1,000
	Total			44,800

Distribution of California Salmon by the Fish Commission of Kentucky.

Date.	Name of Stream.	Tributary to.	County.	Number.
1877.				
Nov. 30. .	Eagle creek.	Kentucky . .	Gallatin . . .	5,000
Dec. 14. .	Doe Run	Ohio	Meade. . . .	5,000
‘‘ 21. .	Rough creek	Green	Hardin . . .	5,000
‘‘ 21 . .	Nolin creek.	Green	Hardin . . .	5,000
‘‘ 29. .	Drake's creek.	Green	Hopkins . .	17,500
1878.				
Jan. 3. .	Jasper river.	Green	Warren . . .	2,000
‘‘ 3. .	Barren river	Green	Warren . . .	12,000
‘‘ 12. .	Pond	. . . .	Woodford . .	500
‘‘ 12. .	Pond	. . . .	Woodford . .	500
‘‘ 12. .	Elmwood creek	. . . .	Bourbon . .	2,000
‘‘ 12. .	Hickman and Jessamine creeks	Kentucky . .	Jessamine . .	4,000
‘‘ 12. .	Pond	. . . .	Franklin . .	200
‘‘ 12. .	Pond	. . . .	Franklin . .	800
‘‘ 28. .	Little river	. . . .	Christian . .	4,000
Feb. 1. .	Eddy creek	Cumberland .	Caldwell . .	3,000
‘‘ 13. .	Tygert river	Big Sandy . .	Carter	2,000
‘‘ 13. .	Little Sandy	Ohio	Carter	2,000
	Total	. . . .	. . . .	70,500

Distribution of Land-locked Salmon by the Fish Commission of Kentucky.

Date.	Name of Stream.	Tributary to.	County.	Number.
1878.				
April 11 .	Asher's creek	Salt	Spencer . . .	1,000
‘‘ 16 .	Pitman creek	Cumberland .	Pulaski . . .	1,000
May 8 .	Pond	. . . .	Warren . . .	500
‘‘ 8 .	Nolin creek	Green	Hardin . . .	1,000
‘‘ 3 .	Pond	. . . .	Woodford . .	500
‘‘ 22 .	Slosser's lakes	. . . .	Boone	500
‘‘ 22 .	Kinniconick creek	Ohio	Lewis	1,000
	Total	. . . .	. . . .	5,500

Distribution of White Shad by the Fish Commission of Kentucky in conjunction with the United States Fish Commission.

Date.	Name of Stream.	Tributary of.	County.	Number.
1878.				
June 4 .	Kentucky river	Ohio	Mercer . . .	130,000
‘‘ 4 .	Elkhorn creek	Kentucky . .	Scott	20,000
‘‘ 1 .	Cumberland river	Ohio	Pulaski . . .	120,000
‘‘ 6 .	Barren river	Green	Warren . . .	100,000
	Total	. . . .	. . . .	370,000

Distribution of Wall-eyed Pike by the Fish Commission of Kentucky.

Date.	Name of Stream.	Tributary to.	County.	Number.
1878.				
May 2	Paddy's Run	Ohio	Jefferson	2,000
‘‘ 3	Bullskin creek	Salt	Henry	2,500
‘‘ 3	South and North Fork of Floyd's Fork	Salt	Henry	1,000
‘‘ 3	Little Kentucky	Ohio	Henry	1,500
‘‘ 3	East Hickman	Kentucky	Fayette	2,500
‘‘ 3	South Elkhorn	Kentucky	Fayette	2,500
‘‘ 8	Bear creek	Green	Grayson	15,000
‘‘ 3	Small streams	Kentucky	Franklin	5,000
‘‘ 8	Bear creek	Green	Grayson	7,500
‘‘ 8	Big Clifty	Green	Grayson	7,500
‘‘ 8	Bear creek	Green	Grayson	15,000
‘‘ 8	Green river	Ohio	Hart	75,000
‘‘ 8	Barren river	Green	Warren	75,000
‘‘ 8	Pond	....	Warren	3,000
‘‘ 8	Salt river	Ohio	Bullitt	15,000
‘‘ 8	Nolin creek	Green	Larue	15,000
‘‘ 8	Nolin creek	Green	Hardin	15,000
‘‘ 8	Rough creek	Green	Ohio	75,000
‘‘ 3	Small streams	Kentucky	Woodford	5,000
‘‘ 13	Clear creek	Salt	Shelby	20,000
‘‘ 3	North Elkhorn	Kentucky	Fayette	5,000
‘‘ 3	Drennon	Kentucky	Henry	5,000
‘‘ 3	Elkhorn	Kentucky	Scott	5,000
‘‘ 3	Salt river	Ohio	Anderson	5,000
‘‘ 3	Little Kentucky	Ohio	Henry	5,000
‘‘ 3	Drennon	Kentucky	Henry	
‘‘ 3	Fox Run	Salt	Henry	
‘‘ 8	West Fork of Pond river	....	Christian	45,000
‘‘ 8	Tradewater river	Ohio	Hopkins	15,000
‘‘ 8	East Fork of Pond river	Pond river	Hopkins	15,000
‘‘ 8	Floyd's Fork	Salt	Oldham	22,500
‘‘ 8	Harrod's creek	Ohio	Oldham	7,500
‘‘ 8	Fox Run	Salt	Henry	......
‘‘ 8	Paddy's Run, Mill creek, and Blackburn's Run	South Licking	Harrison	15,000
‘‘ 8	Strode's creek	Licking	Clark	7,500
‘‘ 8	Stoner's creek	Licking	Clark	7,500
‘‘ 8	Strode's and Kennedy's creeks	Licking	Bourbon	15,000
	Total	....	....	540,000

The Commissioners will continue their labor to the full extent of their means, and it is to be hoped that all good citizens will aid them in every way to prevent the destruction of the growing fry, until the streams are all stocked, and until they are three years old, when they will be large enough for food-fish. Every county should instruct her members to the next Legislature to keep the good work moving for several years at least.

POULTRY-RAISING IN KENTUCKY.

Drops of water form the ocean, atomic, infinitessimal molecules form the entire surface of our globe, vast numbers of apparently little stars form the stellar universe; so it is in all things else, numbers aggregated give size and importance. A few chickens may appear a small thing in commerce to the great banker or stock broker, but when we aggregate the number of chickens used in New York City alone, and say that they and their product cost the consumers annually over $25,000,000, then we begin to see what an important factor poultry becomes in the productions and commerce of our country. If a man was asked which produces the greatest profit to the farmers of Kentucky, the *wheat crop* or the *poultry crop* each year, he would doubtless reply, without hesitation, the wheat crop ten times over. Now let us see. The test of the value of any product is its usefulness, both in selling and in consumption. The crop of wheat grown the summer of 1878 did not exceed 5,150,000 bushels in the State, which, at eighty cents per bushel (a full average sale price), amounts to $4,120,000. The number of chickens in the State is estimated at 6,381,100, which, at eight cents each (a low price), amounts to $510,488, to this add the estimated number of eggs consumed and sold, viz: 38,286,600 dozen, at ten cents per dozen, amounts to $3,828,660, making of chicken products the sum of $4,339,148, or $219,148 more than the value of the entire wheat crop. This calculation does not include the products of other fowls of the poultry-yard, such as ducks, turkeys, geese, pigeons, and guineas. These prices, too, were they placed at the figures usually obtained by hucksters in our cities, instead of the low rates allowed to farmers' wives, would increase the valuation of chickens, above those here given, from one hundred to two hundred per cent., so that they would yield a price about equal in value to that of the tobacco crop of the State. In one single county (Bucks) in Pennsylvania, where the leading agricultural industry is dairying and poultry-raising, statistics show that, while the butter and calves combined yield less than one and a quarter millions of dollars, the poultry crop yields more than $2,000,000 per annum. It will seem strange to our farmers to see such large figures placed to the credit of such an apparently insignificant industry, but if they will get their slates and figure awhile upon the subject, they will find that the tale is not half told.

The demand for poultry and eggs is heavily on the increase each year, and will so continue for generations to come. As an article of diet, poultry and eggs are universally acceptable. The only misfortune is, that they are never in sufficient supply to meet the craving appetites of all who desire them as food. They are luxuries, wholesome, digestible, and nutritious, and particularly adapted to the use of the teeming population of large cities, and for all persons engaged in sedentary life or brain-work, such as authors, literary men, clerks, professionals, and persons of delicate constitutions.

Our towns and cities are rapidly growing in population. Within the last one hundred years the cities and towns have increased their ratio of population from 12½ per cent. of all the people, until now they contain 58 per cent. This condition of things, the legitimate outgrowth of new inventions and labor-saving machinery, must be provided for, so as to make the smaller ratio of producers supply the food demanded of the greater ratio of consumers; and one of the largest items in the account in the future will be the poultry industry here, as it now is in France and China, and in the other old countries of Europe and Asia.

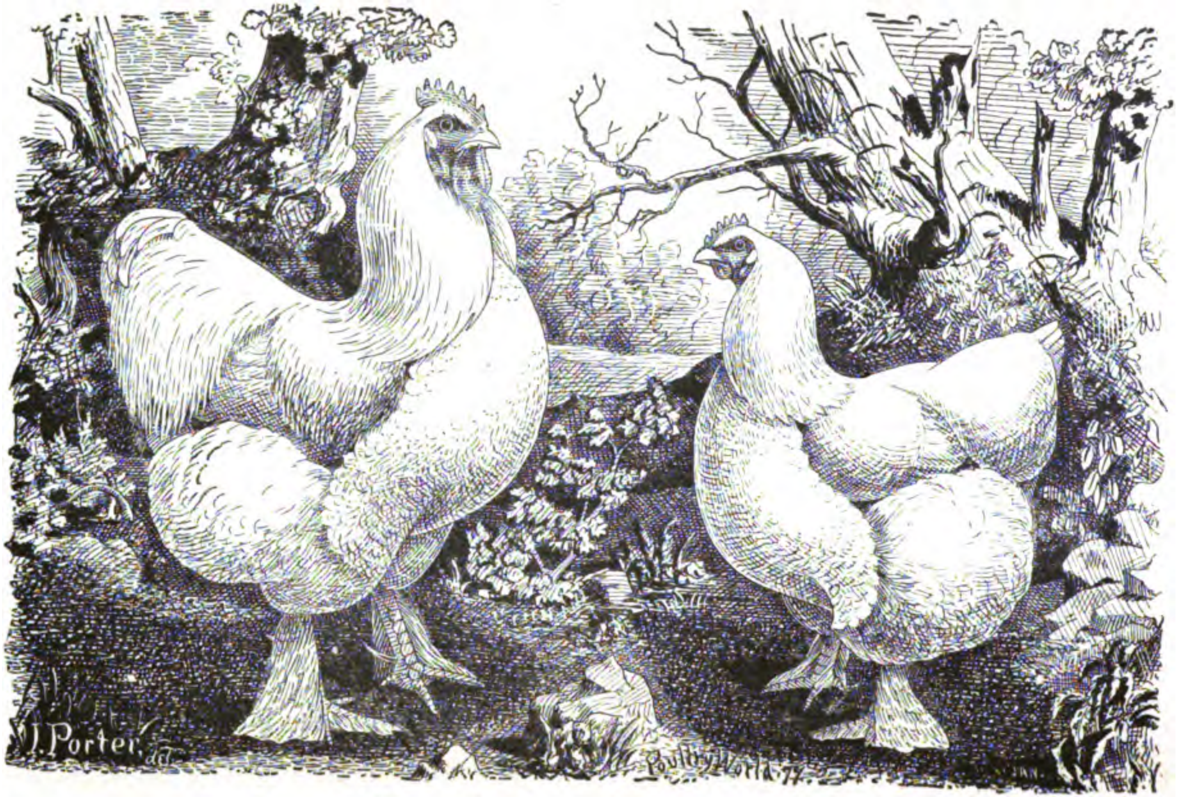
It then becomes to us an important inquiry, how we can most profitably increase the yield of our poultry-yards, and create a supply of eggs and fowls for the use of the great cities, which are rapidly growing up within our midst, as they are throughout the Union. Before the end of another centennial year we will be the largest manufacturing country on the globe, with the heaviest city population. Let us begin in time to prepare food for this population, and to arrange means to increase it, as the numbers of our people multiply. For this purpose, our fish and poultry culture must come more prominently forward, and take their relative positions among the other great industries of our country.

Poultry-keeping is entirely a domestic employment, and is susceptible of general diffusion. It is not necessarily confined to the farm, but may be practiced, with pleasure and profit, in small towns and villages by every class of people. It is a business capable of almost indefinite expansion; on a small scale very little capital is needed; the expense of keeping fowls is not great while the profits are relatively large. As an exclusive livelihood, no rural employment pays better. Energy, skill, and economy can be practiced, however, in poultry-keeping, as well as in any other calling. No little degree of science and practical knowledge are needed to establish and conduct a first-class hennery.

To raise poultry successfully, it is necessary to have the birds in nearly as natural a condition as possible; for this reason the "hen-houses" ought not to be too close, but sufficiently open to admit free circulation of air. A common split-rail pen, ten feet high, covered with boards, or even cornstalks or straw, will answer well in this climate for a poultry house; provided it is placed on a good dry locality, exposed to the sun, and protected on the north and west sides by boards tacked against the rails, or by cornstalks set against the rails. The nests should be protected by boards placed over them, made easily accessible, and darkened, so as not to have the hens uneasy or scared, when in the act of laying or incubating. The roosts or perches should be of easy access, in the roof of the house, by step-ladders inside and outside of the pen. It is best to have the perches so arranged that the droppings from the roosts will not interfere with the nests. It is best to have separate pens or houses for each colony of twenty-four hens and two cocks, and also to accustom the fowls to roost, each one in its proper domicile.

Fowls should be permitted to range at liberty whenever there is room for them, particularly if by so doing they are enabled to supply themselves with insect-food sufficient to satisfy their appetites. Vegetable food is best for their general diet, but a liberal supply of insect or meat, fed them occasionally, will greatly increase their propensity to lay eggs. During the winter, if fowls are fed generously on corn, oats, barley, or rye, mashed or ground, with an occasional supply of meat scraps of any kind, they will repay abundantly this extra care in eggs; but care must be taken not to make the hens too fat, which is easily done, as this lessens very much their productiveness. Neither a lean nor fat hen is best for eggs, but one in good order, moderately fed upon a generous diet, with free access to sand and lime whenever appetite or inclination presses her to the use of them. All kinds of birds thrive best on a diversified feed—for instance, corn one day, oats another, the screenings of wheat mills, &c., &c. All kinds of sorghum seed, or African wheat, or chicken corn do well for the poultry-yard, probably better than any other kind of grain.

The "Light Brahmas" are probably the most prolific "winter layers," though the Spanish and Dominiques are very fine. The game chicken, mixed with any variety is good both for flesh and eggs, and other kinds



LIGHT BRAHMAS, the best of the Asiatic breeds of Chickens. [p. 142.]

suit almost equally as well for general use. It is very much a matter of fancy which breeds are best, as we find among "fanciers" advocates for all the most popular varieties. In 1856 several varieties of large chickens, Shanghai, Brahma, Cochins, &c., were introduced into the United States. These have increased the size of our poultry, but it is very doubtful whether we have not lost more in the flavor and texture of the flesh than we have gained in the size of the fowl.

Diseases Among Fowls.—The main drawback to a large increase in poultry production, is presented in the various ailments and diseases which attack the birds through every season of the year. Millions of dollars' worth of poultry is carried off each season by what is commonly known as "chicken cholera." This disease affects the birds, very much like hog cholera does swine, and is equally as fatal. It was never known as a disease among poultry in this country until after the introduction of the Asiatic breeds—about the years 1855–'6. Since that time it has been prevalent everywhere south of the 40th degree of north latitude, and west of the east portion of the State of Pennsylvania. It is so well known that I will not describe the symptoms of the disease, but will give some of the most popular remedies and preventives for this terrible scourge. Like cholera with other animals, it is now generally believed by microscopists and physicians to originate from a poison, introduced into the system by the inhalation of microscopic animalcules or insects, so small that they must be magnified over five hundred times their natural size to be seen with the eye. These parasites are very hardy, and live through any ordinarily cold weather in winter, after doing damage every month in the year. No one has ever discovered any perfectly reliable specific cure, although many quack nostrums have been advertised as such. The best and only remedies so far discovered are the different kinds of insecticide articles known in pharmacy, such as carbolic acid, coal oil, turpentine, alum, sulphur, and decoctions of such plants as henbane, smart-grass, male persimmon leaves, peach tree leaves, strawberry leaves, infusion of tobacco, poke-root, and numerous other plants known by nature to be insecticides. It is said that if persimmon leaves, peach leaves, carbolic acid, sulphur, or similar insecticides, are occasionally placed about the nests and roosts, that chickens will never have any sign of cholera. A good preventive is to provide good soft dry dirt under a shed, in which chickens can freely wallow, and frequently sprinkle coal oil, sulphur, carbolic acid, or ashes and lime, over the dirt. It is an excellent plan to pull down and remove the houses every few years, and then burn up all the old nests and other litter on the spot from whence the houses were taken. Cholera does not affect water-fowls.

Besides cholera, fowls are subject to catarrhal affections (roup), diphtheria, gapes, lice, &c., &c.; but these never become so serious as cholera, except gapes among young chickens. Gapes are caused by worms, the germs of which are inhaled by the young fowls, and afterwards grow to considerable size in the windpipe, so as to cause death by suffocation. In this disease prevention is better than cure, and the same preventives used against cholera are equally as good against gapes.

With other fowls diseases are not so bad as with chickens; turkeys, ducks, geese, guineas, peafowls, and pigeons only need care and attention while young, and until they are able to roam the yard or field freely, when they can generally easily provide for themselves. Good clean water is an indispensable requisite to every poultry-yard. This can be had either in a spring, a lake, or in troughs, frequently replenished.

There are now, by estimation, in Kentucky not less than 6,381,100 chickens, 1,320,000 turkeys, 600,000 ducks, and 360,000 each of geese, guineas, and pigeons, worth probably, in production of flesh and eggs, an aggregate yearly value of eight or ten millions of dollars. Surely this immense amount of property needs the fostering care of our energetic citizens, who can, with but little trouble, within the next decade, carry the production of our poultry-yards annually to over $30,000,000.

To Preserve Eggs.—There are many ways popular among poultry fanciers for preserving eggs, but they all operate upon the same plan, viz: to coat the shell, while fresh, with some substance which will keep out the oxygen of the atmosphere. No doubt the best way to do this is to immerse the egg, when very fresh, in oil or lard, and then take it out and place it, little end downwards, in some cool place, where it will not be moved. In this way any fresh eggs may be kept sound for several months; but they will never hatch after they are greased.

To be successful in marketing poultry products, it is best, if possible, to be near some large town, or near a railroad depot, since transportation by hand or wagon readily eats up the profits of the business. The land and climate of the entire State of Kentucky are peculiarly adapted to poultry raising, and nowhere probably in the world can eggs, and the best of fowl flesh, be produced more abundantly or cheaper than right here among us. Any one who will use figures can see that no business can pay better on an investment of a small capital, and none be more certain in its returns, even on a large scale.

Science has been brought into requisition in poultry-raising, as well as in every other employment, and in France, where over $100,000,000 of poultry is consumed each year, more than half is hatched by steam, and cared for in raising without the fostering care of the hen. The Parisian correspondent of the California Farmer thus describes the process:

"*Chicken-Raising by Steam.*—The idea of hatching eggs artificially is as old as the hills; what is new is the machinery, the incubator for effecting the process. This means of hatching eggs of all barn-door fowls, as well as those of pheasants and partridges, has taken a great extension in France; indeed, in many cases it has become an amusement. The machine employed in this country, and recommended by the agricultural societies, is generally a box four feet long, three feet high, and two wide; it is divided by means of drawers, to contain over 400 eggs; the warm water being placed in the centre, and the heat distributed and graduated by zinc cases; the eggs are placed endways, so as to receive heat on the two surfaces at once; not much trouble is given to control the incubator. The water is renewed morning and evening, and the heat regulated according to fixed rules; a series of small windows permit the air to circulate, and the hatching is quite independent of atmospheric influences, as it can take place in the coldest weather. The 'mother' is represented by a curtained box, heated similarly, and having hay for the chicks to run upon; the first day they receive no food; the second and third days, crumbs of bread, cooked milk curd, milk, etc.; later, a paste of barley or maize meal, beaten up with milk or water. The latter should be their drink, but only after the third day from being hatched. The principal difficulty hitherto has been, to distinguish between fruitful and sterile eggs. A lamp is now employed, called the *Indiscrete;* it is a petroleum lamp, over which falls a slide, containing an oval space, size according to the egg, wherein the latter is placed, big end upwards, as if it were held between finger and thumb before a candle. After the fifth day of hatching, an experienced eye will easily detect the sound egg, as the embryo will present the appearance of a spider swimming in the middle of the egg. If this test be not satisfied, the egg is dead. After the fifteenth day the egg becomes quite black, the air-space becomes larger and larger, till the chick chirps its way out. More than one half of the poultry raised in France for the home and foreign markets are thus hatched."

CO-OPERATION AMONG FARMERS.

By Hon. Paul A. Chadbourne.*

"We have had this afternoon, gentlemen of the Board, some very interesting experiments recounted here—experiments for the purpose of causing an acre of ground to produce more than it had produced under the old methods of cultivation, and I know that those experiments have been very successful. I called upon my friend Stockbridge for his formula, and he did not tell me that I must wait until it came out in the College report, but gave it to me at once! The experiment succeeded admirably. I am satisfied that he is working out successfully that valuable problem of making two blades of grass grow where one grew before. But in all these discussions there is one thing comes home to me: What is the use of all this production? Why are we so anxious to cause these acres of ground to produce so much more than they produced in former years? Evidently, the thing we are all aiming at, is the great problem of living. How are we to make life more pleasant, more desirable, than it has ever yet been, and especially, how are we to make farm-life more desirable? For we are constantly saying, 'The young men are running away from the farm; they are turning aside to other pursuits;' and the great thing we have before us is, not only to make our farms productive, but to make them the most attractive places in the world. Now, I propose to address myself this evening to one simple phase of this problem of living—one of the phases which, I believe, presses itself home upon the attention of the farmers of this broad land.

"The problem of living becomes more and more complex as civilization advances and population becomes more compact. Savages, in their low plane of life, can live on the chance products of the earth—owning all such products in common, or having the common right of taking them. The pioneer, who is willing to forsake his kind, can find places where he can supply his animal wants with almost as little forethought as the fowls and wild beasts require. An old Jerseyman, whom I found on the western coast of Newfoundland, told me *that* was the best place in the world to live in. 'Why,' said he, 'here is wood for the cutting. A little patch of ground produces all the potatoes and cabbages I want.

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*Note —From Agricultural Reports of Massachusetts.

In the spring, when the herring come in, I can take enough of them to send to Halifax in the fall for all my flour and supplies. In the winter there is plenty of game for eating and to give me a good bit of money for their skins.' Another Englishman, who owned a little trading schooner, gave me nearly the same account, and then added: 'Here we have no taxes to pay,' and then he recounted with intense expressions of disgust the taxes which they had to pay in Halifax for roads, for schools and churches! He paid taxes for no such things, and he was content to have none of them. And such men you find all up the coast of Labrador and on our western frontiers, scattered all up and down among the Rocky Mountains—men who live mainly on the natural products of the earth—a mode of living impossible when population so increases as to give the benefits of civilized life. While it is easy for men to live under such conditions, and comparatively easy for men who have fortunes left to them to start in the world in any business, it behooves the American people to consider the problem how every one of their citizens may secure a home, and secure to himself and his children at once the advantages of civilized life. We can, any of us, start off and find a home of our own; land is waiting for us. I have spent a good deal of time, where, if I liked a piece of land to live upon, all I had to do was to measure it off and take possession; and it was mine; land rich, surrounded by grand scenery, and abounding in mineral wealth. We can start for such places to-morrow. But who wants to go as a pioneer? To take the chances of the neighbors that may settle near him, shut himself out from the refinements of civilized life, and bring his children up amid the surroundings that may be a curse to them? Especially if he is poor—has but just means enough to reach his plot of ground, he has the risk of sickness and want before him, with, perhaps, no one to lend a helping hand. But now suppose twelve or twenty young men should go together, could not they form a community of their own, and carry with them all that is best in New England home-life, and stand by and aid each other, and bring up their children with good examples before them? If I shall seem to you to night to say some things that belong to a social science gathering, I speak because I have thought much on these things; and while I am anxious to do all in my power to guide men in cultivating the soil, I want this knowledge of agriculture to be subservient to this one idea of increasing *the number of cheerful, pleasant homes in our land.* I do not want agriculture to take such a form that men shall be induced to dwell in cities, nor to look to trade and manufacturing as a means of buying farm products, except when they are compelled to. I want agriculture to take such a form as to call the largest number possible away from these pursuits, where too many are now crowding to live lives of dependence with uncertain incomes. I want to see the thousands of little homesteads all over our land, giving to their owners the substantials of life from the soil itself, giving them the means of rational living always, as a reward for industry and homely economy.

"This is a time of general complaint in business; and in this disturbed condition, we see the danger that hangs over some great communities, that productions of certain kinds shall be stopped, and whole masses be thrown out of employment—whole masses that are in the main unprepared for idleness, because they have no reserve of property, and yet live under such conditions that every day demands pay for shelter, food, fuel, and raiment. Now, it is not simply a problem for our country to solve that we shall become great producers, but it is that all our people shall have the conditions of living; that property shall be well distributed; or that the largest number possible shall have homes of their own, and the means of plain living, to say the least. Our cheap land has thus far been our safeguard. But we do not want our cheap lands and system of agriculture to lead to great estates. We want, instead, a sub-division of land, so that we shall have the largest possible number of independent homes; yet we want the advantages that come only through extensive business arrangements. Can we secure these two desirable ends? It is very difficult to do so, but it is worth while to try, at least to discuss the possible principles of action, so that while we learn how to cultivate an acre to the best advantage, we shall also be learning the best manner in which to make that acre subservient to the life of man, securing for him comfort and independence at the same time. It seems to me, that much can yet be done to draw people from the over-producing forms of industry on the farm. Many of the schemes that have failed, and many now in operation, are worthy of study, as having in them some element of good—some element that can be woven into a better system yet to be worked out.

"There are certain principles of human nature that are so strong and so essential to the full development of the human race, that any system of labor or government that ignores or represses them, must in the end fail. It sometimes happens that schemes that have in them much that is good, fail partially or completely, because they are pressed too far; because they ignore principles that are just as essential as those upon which they themselves rest.

"1. I take it for granted that any system of co-operation that ignores, or tends to break down the family relation, will fail utterly, or will be confined to small and peculiar communities that can be gathered from the people, and assembled in a particular place. Such a system can never be accepted by any ordinary community; that is, it can never become universal.

"2. I also take it for granted that co-operation must be of such a nature that each man, or head of family, shall have a voice in the management of the property concerned, and a return in proportion to his agency in promoting its increase. Any co-operation that ignores the family, or seeks to merge the family in the community, and all profits into a common stock, can never have more than a temporary or limited success.

"We make these remarks here; because we know that co-operative schemes have been attempted, and have failed; schemes that had in them many excellent ideas; schemes that, in theory, promised well, failed because they were not built on the strongest instincts of the race. It may be well to glance at two or three co-operative experiments by way of illustration, and this I propose to do, after considering more fully the general bearing of the question on every-day life, or the principles of co-operation that society has found to be essential to its life, and enforces by civil law or custom.

"It is plainly impossible for men to live, and have the benefits of civilized life, without co-operation in some form. The question to be considered in the end by us is, how far voluntary co-operation can be carried to advantage, especially among farmers. We shall attempt to discuss the general principles of co-operation, illustrate the subject by examples of successful co-operation, and point out the possible extent to which this principle can be carried in New England agricultural districts and in new settlements.

"The necessity for co operation is so great, that, as we have intimated, society, as a whole, demands it, and the laws enforce it, not upon any class, but upon the people as a whole. The demands change according to the conditions of the community. All our public roads are examples of co-operation. The law compels every man to do his part in building and maintaining these highways, because they are essential to civilized life; they are such common benefits, that, as all would not voluntarily do their part to secure them, society compels each man to join with his neighbors in the work—a work essential to progress, essential to the enjoyment and profit of all. Public schools are a second example of enforced co-operation. Such schools are declared to be essential to our civilization, and so society demands that each man shall do his part in sustaining them. In both these instances, the principle of co operation is carried farther than it could be carried voluntarily in the community at large, until the world is much better than it now is.

"The principle enforced in these cases is, that men must contribute according to their property, while all have an equal right to the advantages. The man who pays but a poll-tax has the same right in the public highway and to the public school as the one who pays a hundred times as much. In fact, up to a certain point, society acts upon the communistic principle. We go to the ballot-box and vote away money. We do not vote away our own money in every case, nor the money of this man or that man; we vote away a certain part of *all the property in the town or State* for the public uses. In our State, the man without a penny may have as potent a voice in taking that money, and in determining its use, as the man who claims a million. We say, in any town, 'We want fifty thousand dollars this year to keep good roads for all, good schools for all, and to give food and raiment and shelter to those who cannot obtain them for themselves.' We send out a man—the tax-collector—to take so much property wherever he can find it. Up to this point every good citizen is a communist. And it is a fact, that the more civilized a society, the farther does this principle of communism prevail. Witness the advance of public schools, the provision made for the poor and unfortunate. Although the operation of this principle, up to a certain point, is good—even essential to society in its best forms—there are only a few in the world who claim that it is possible or desirable for this principle to prevail universally.

"But there is also much voluntary co-operation that has in it the element of the communistic principle. In most of our churches the expense is voluntarily borne by comparatively a few. In almost every Christian church the hearer is welcomed, whether able to pay or not. In our colleges, the money given is for the perpetual use of young men or women. Those who pay most, pay but a mere fraction of what is spent for them.

"In other cases the benefit, or possible benefit, is as the amount contributed—as in mutual insurance companies—a most beneficial form of co-operation.

"The growth of all these is understood, and their principles are recognized as wholly beneficial.

"As we have remarked, co-operation, under the communistic system, can prevail *wholly* only in limited communities; that is, where some form of intense religious life, or abnormal philanthropic views, are more powerful than the instinct of separate ownership in property. This state of things can never, we believe, control any community, except it be a community drawn together by taking here and there one from the great mass. But from such communities we can learn much of the possible advantages of voluntary co-operation among those who would divide profits.

"It is a dream of some that wages should disappear, and that all should become partners in business. This would be desirable, were it feasible. I should be glad to see the whole community raised to that standard, that working for wages should be confined to the young; that every man should aim to become an owner—and, at last, become an owner, sole or in part, in business. The thing that now renders this impossible for all—and, perhaps, always will render it impossible—is the want of thrift. A home of one's own; a business of one's own, means *laying up money*. So long as men so plan their lives, and so live, that their wages are spent as soon as they are earned, or before, a home and a separate business are impossible. So the escape from the wages system can come only through hard work, economy, and wise living. When will the whole community come to that?

"The first scheme of co-operative *farming* that I shall mention, was one founded on generous views of human nature, on the supposition that the common farm-laborers of England, if supplied with capital, land, and appliances of the best kind, would at least be able to supply their own wants, and keep the property good by their united labor. In other words, it was an attempt to see if men who had been accustomed to the wages system could not be brought into a better condition on the principle of co-operation, provided they had every needful advantage supplied to them.

"Mr. William Lawson, from 1862 to 1872, at Blennerhasset, in Cumberland county, England, tried the experiment of co-operation by buying and stocking a large farm, going into extensive improvements, buying expensive implements, and providing all the appliances of scientific farming. The defects of the experiments seem to have been—

"1. Leaving the work to incompetent hands. His parliament, in which all had a right to speak and vote on the manner of conducting the business, was a failure. Decisions were made by those ignorant of the work.

"2. It was known that there was a deep purse to draw upon, and so individual responsibility for success was in a measure lost.

"3. The persons concerned had never planned and made property for themselves. They were in the condition of paid laborers, who must depend upon others to plan and carry on business. And no set of paid laborers that I ever saw will go on a farm and earn their wages for a year, unless they are under the leadership of some master-mind who directs.

"4. Mr. Lawson had other hobbies that took up time and attention

"As a result, he found a loss in ten years, on farm and buildings, of over thirty thousand dollars, in farm accounts of over thirty-five thousand dollars—about sixty-seven thousand dollars in all.

"His experiment was founded on a kindly view of human nature. He found the difficulties which meet every reformer—laziness, viciousness, and incapacity. He found, as every man must find, that business can be carried on successfully only when all employed work to advantage. If you would have co-operation, all must have the ability and will to do their part, or else the willingness to put themselves under the control of competent leaders, as workmen are controlled in the service or wages system. The necessity for such control and direction for the mass of men, is one of the reasons why the wages system prevails so extensively as it does.

"The second example of co-operation I shall cite, is that of the Mormons in Utah. This is peculiar, as connected with a religious organization. I do not propose to consider at all the peculiarities of the case, but to point out the benefits that have come to that people through co-operation.

"Twenty-eight years ago, they came into Salt Lake Valley so poor, that they kept themselves from starvation with roots and berries; but they were so numerous, that they had among them the elements of all industries. They moved under the direction of their leaders, who divided the ground and directed the labor in general. They had a country that must be irrigated, and that system of irrigation binds together every community in that whole territory in a system of co-operation and mutual dependence. Water must be distributed, and the rights of all to it be secured. They are compelled to pay one tenth of their income to the church. And yet that people have become rich; their accumulations have been wonderful, if you reckon the public improvements as well as their private property, and private property the church respects and encourages. There is no communistic system. Their co-operation is such as might prevail in any community with different religious beliefs.

"Their trade is on the same plan. '*Zion's Co-operative Union*' does the trading for all the Mormons of the Territory. It buys in immense quantities, and distributes to each settlement, and in each settlement just help enough is taken to distribute the goods. There is no waste from useless stores and unemployed clerks. Any one who wishes a part of the profits of this trade, has but to put in his money and draw his proportion. When we see one hundred thousand of the poorest people in the world carried across the wilderness and made comparatively rich in a few years, we see the possibilities of co-operation, and long for a principle of wisdom and wise forethought that shall secure what blind faith and obedience to church officials have here wrought.

"The third instance is that of Anaheim, in Los Angeles county, Southern California. For this account I am indebted mainly to Mr. Charles Nordhoff's valuable work on 'Communistic Societies.'

"In 1857, fifty Germans of San Francisco, California, bought by an agent, Mr. Hansen, eleven hundred and sixty-two acres of land, at two dollars an acre.

"None of them were farmers; but there were carpenters, blacksmiths, a teacher, a miller, a hatter, merchants, teamsters, etc. They were, with one or two exceptions, poor. They continued to work for wages, and Mr. Hansen cared for the land, improving and planting it by hired labor.

"It was divided into fifty twenty-acre lots and fifty village-lots, of one acre each. In three years, the distribution was made to the owners, and by that time each shareholder had paid in twelve hundred dollars. Those who could not raise all the money were helped by the others. The farms were divided by lots, some paying more and some less, according to the appraised value of each estate.

"Here was a settlement of fifty families—co-operation for three years. Then co-operation ceased. Not one failed. In 1872, the property that had cost each of them, on an average, one thousand and eighty dollars, was worth from five thousand to ten thousand dollars—say an average of seven thousand five hundred. They had lived well, and had enjoyed all the advantages of society.

"They grumbled! And Mr. Hansen said he would rather starve than conduct such another enterprise! I think there are places in New England where such communities would do well.

"But the advantages of co-operation may be reached to a much greater extent than they now are. The Granger movement—so far as it secured concert of action among farmers for their work and profit—was a move in the right direction. We have made progress in farming and in farm-life in many respects, but many of the pleasant incidentals of farm-life have passed away.

"Poverty made our fathers mutual helpers. And the want of facilities for travel made them apt to seek social enjoyment in the neighborhood. They borrowed and lent. They 'changed works,' and the young men of one farm hired out with neighbors for haying or hoeing or harvesting, and the daughters went to work in other families where there were sons instead of daughters, and often remained there as wives. The good farmer could not husk his corn without calling together all his neighbors, old and young, to fill his barn with merry laughter and eat the baked beans and pumpkin pies of the good housewife. And she, in turn, must have her 'apple-bee,' where work and fun and frolic made scenes that we old fellows remember as the poetry of the rough farm-life of forty years ago. There was at that time a vast deal of rustic co-operation that was helpful, and which, best of all, favored social life pleasure in the neighborhood—which none of the parties and calls of fashionable life can compensate for.

"Much of all this has passed away, perhaps no more to return, though I hope to see some of it again, as open fire-places are once more sending up their cheerful blaze for family gatherings, and the old brass candlesticks are once more finding their place on the mantel-piece.

"But there are more important matters now in which co-operation might be carried much farther than it is.

"1. In the matter of introducing improved machinery. It is not too much to hope that steam-ploughs may yet become of service to us in the West, and in parts of New England. These and other expensive machines might well be owned in common by a community of farmers.

"2. Farmers and mechanics might combine to aid each other more efficiently than they now do. We want to see our manufacturing industries distributed as rapidly as possible, to prevent great accumulation of people at single points, and to save transportation of food and stock for manufacturers and manufactured materials to consumers.

"3. Co-operation might develop new kinds of industry. I see no reason why the problem of beet-sugar might not be worked out successfully, if twenty good farmers would combine for this purpose. Cheese-factories are a successful illustration of what co-operation can accomplish for profit, and the comfort of the household which is now freed from the labor of cheese-making.

"4. Fences. Money enough might be saved among the farmers of New England to nearly pay the farm-taxes of New England, if they would wisely co-operate in this matter of fences. As it is now, every man has to fence around everything he has, to keep cattle *out*, whereas fences should be built only to keep cattle *in*.

"These are mere hints as to the lines of co-operation that might be extended to the profit of every community.

"In one other respect, there is the greatest improvement to be gained, and that is, in beautifying grounds. If all the farmers in every neighborhood would join in road-making; seeing that all their roadways and roadsides were made pleasant to the eye; that every tree cut, and every one planted, should have reference to the beauty of the place, the homes in such a neighborhood would soon become beautiful, and if thrown into the market, would bring fifty per cent. more than the same property surrounded by the tokens of neglect. The improvement on every farm helps the neighbor. In some villages this co-operation has wrought wonders. The effects of the Laurel Hill Association, of Stockbridge, and the Fern Cliff, of Lee, are examples of the pleasure and profit drawn from such co-operation. We in Williamstown have done something in the same direction. When all work together in the same line, and for a given purpose, it is marvelous to see the results.

"We want to see every New England town permeated by this spirit of union which aids in the accumulation of property, and in beautifying our homes. It is in accordance with the spirit of farming, which is, to aid others. For what purpose do we have our agricultural exhibitions? For what purpose do we meet, and our Secretary work, but to co-operate with each other, to make known everything we discover to aid our fellows? Let this principle be carried as far as it can possibly be carried, and leave the home and independent business for the head of each family intact.

"Every change that promises good fellowship in neighborhoods, and in the work of life, and, above all, anything that promises to take multitudes from those methods of living that are unstable, and tend to continued poverty, and bring men into modes of living that promise permanent plenty, independence, and healthful, happy homes, should receive our careful consideration and hearty God-speed. We do not believe in communism, nor in communities isolated by peculiar religious or social views. We believe in no system that cannot embrace an entire community, with all its peculiar opinions and social theories. We believe in no plan that is not adapted to the people as a whole. The principle of co-operation prevails from necessity up to a certain point. Can it not prevail much farther than it has ever yet done—saving labor and promoting intercourse and the innocent pleasures of life? If it can, it is worth our while to bring its benefits before the community, and aid those who are willing to do their part to avail themselves of its benefits in our settled New England life, or in those new States that are waiting for thousands of new communities, such as might be formed under wise leadership from the young men of our farming districts, or from the overburdened population of some of our large towns and cities. It is a good thing for us to cause two blades of grass to grow where only one grew before; but the most glorious thing an American citizen can do for his country and his kind, is to cause two happy homes to arise where only one was found before. For the great crop of the world—that toward which all others are but the means—is a generation of noble men and women, filling and adorning thousands of simple rural homes."

MUSHROOM CULTURE.

Any man is a benefactor to his race who, by discovery or invention, adds to the general good and welfare, either by bringing to light new principles in mechanics, applicable to labor-saving machinery, or by increasing, through close investigation and experiments, the list of herbs or plants that may be made useful by man either for food, medicine, or raiment. A large field for usefulness is open to the energetic, patient, and thoughtful investigator in reviewing the vegetable kingdom, and bringing into cultivation and favor many herbs or plants which are now considered baneful, or at least unsuited for any practical advantage to man. The immense variety of *fungi* that are everywhere to be found, doubtless deserves more attention than has ever been given them by the botanists, scientists, and microscopists. The recent investigations of the medical faculties show, that microscopic fungi, or vegetable parasites, or else animal parasites, are the causes of many of the most malignant diseases known to man, such as cholera, small-pox, yellow fever, malarial fevers, typhoid fevers, and nearly all eruptive maladies. It is hard to tell, in every instance, whether these microscopic parasites belong to the vegetable fungi or to the animalcules; but in diseases which afflict plants and vegetables, the majority of microscopic parasites possess our vegetable life, as, for example, in potato rot, pear blight, wheat rust, smut, scab, and various other well-known pests. This interesting branch of the subject will not be discussed at this time; but I will only introduce to the reader's consideration a most excellent article, written by Hon. Thomas Taylor, microscopist of the Department of Agriculture at Washington, which is devoted exclusively to the *edible mushrooms*, their mode of cultivation and uses. Mr. Taylor uses botanical terms in giving the names of the different fungi or mushrooms, in order to be more exact in their description, and to prevent mistakes by persons who may desire to experiment with this delicate and excellent article of food. The length of the descriptions are necessary in order to bring the subject to the full comprehensive of producers. Mr. Taylor says:

"The importance of the mushroom as an article of diet has never been properly understood in the United States, nor is it generally known how abundant our supply of edible mushrooms is. Many of those popularly supposed to be poisonous are not merely innoxious, but highly nutritious, containing, as they do, many of the elements of animal food·

"In France, Germany, and Italy the mushroom forms so important a part of the food of the people, that one distinguished writer has spoken of it as the 'manna of the poor.' In Transylvania the oyster-mushroom is so abundant, and is so largely used, that tons of it may often be seen in the markets; and in some parts of Germany the Morel-mushroom is so popular that the people, finding it to grow best on a soil treated with wood ashes, were accustomed to burn down portions of the forests in order to secure favorable spots for its cultivation; a practice which the Government ultimately found it necessary to interdict.

"It is hoped that the collection of drawings, which has been made with so much care, will serve to call public attention to the value of the mushroom as an article of food, and at the same time furnish means of discriminating between the poisonous and edible varieties of the plant.

"Particular pains have been taken to represent the last-named class of plants as fully as possible, a number of collectors having been employed for the purpose in various parts of the United States. Among these may be mentioned Professor Peck, of New York, who, in that State alone, gathered no less than eighty species of mushrooms, including several which are new to science. The specimens furnished by Professor Peck are admirably copied and colored to nature. There are also several excellent photographs made from specimens furnished by various collectors, representing different genera and species of the same class of plants.

"Another series of drawings illustrates the action of pear tree blight, showing the effects of the chemical changes which take place in the interior structure of the tree under the attacks of the fungus to which this disease is due. The disease of plum and cherry trees, known as 'black-knot,' is illustrated in a similar manner, some of the drawings exhibiting it as it appears to the naked eye, while others show in detail its distorted, woody structure. The fungus which produces it is also shown at various stages of its growth.

"The fungus *Peronospora infestans*, which causes potato rot, is illustrated in the various stages of its growth. There is also a series of drawings of its 'resting spores,' recently discovered by Prof. Worthington Smith, and so named from the fact that they remain for months in a stationary condition, or, in other words, *rest* for that time without germinating.

"There is an interesting series of drawings, representing, as seen through the microscope, the mould of bread, cheese, jellies, &c., and illustrating their habits of growth, a knowledge of which may often be useful in preventing beer or milk from souring and wine or bread from becoming 'ropy.'

"One of the most curious of the cryptogamic plants is the *Protococcus nivalis*, which, we believe, was first found by Captain Parry, during his northern exploration, and to which was given the name of 'red snow,' from the fact that it gives its own red color to the surface of the snow on which it grows. This singular little plant is represented by several drawings of exquisite finish and color.

"The fibers of hemp, flax, jute, ramie, esparto-grass, and Australian flax, as well as wool, silk, calf's hair, and the hair of the Cashmere and

Angora goats, are exhibited as seen through the microscope, both in their natural condition and under various forms of chemical action. In the course of my investigations on this subject, I found a number of new chemical tests by which the presence or absence of certain of these fibers in every fabric may be determined. This series of drawings will, therefore, be of considerable interest to manufacturers of textile fabrics, to dealers in that class of goods, and to the Government, which, besides being an extensive purchaser of clothing for the Army and Navy, is largely interested in determining correctly the materials composing the fabrics which pass through the Custom-house.

"There are a number of drawings illustrating the methods employed by me in detecting the presence of animal and vegetable starch and cellulose in various parts of the animal economy. The investigations to which these drawings relate are still in progress, but the great majority of the drawings relate to the leading families, orders, and genera of cryptogamic plants or fungi, of which by far the greater number are microscopic in size.[1] The latter are often visible to the naked eye when massed together in large numbers, presenting, in some cases, the appearance of a pigment on the surface of the plants upon which they fasten. In such cases the microscope sometimes reveals millions of spores to the square inch. The ravages of these minute vegetable organisms are incredible in their extent. The potato has at times been threatened almost with extinction. Grasses have been affected by them, and the cereals throughout large districts have at times suffered blights so serious and so often repeated, that the farmer has been almost ready to abandon their cultivation in despair. Fields of hops, vineyards, and orchards have withered under their blighting touch, and in lower latitudes they have assailed coffee plantations and groves of orange, lemon, and olive trees with equally fatal results. Even the hardy forest trees have not in all cases escaped their devastating influence, and at the present moment many of the stately maples in the public grounds of our cities are withering under the insidious attacks of these minute destroyers. In short, there is hardly any department of agriculture, horticulture, or forestry that can claim exemption from their ravages; and the importance of a correct knowledge of their characteristics, modes of propagation, and development, and the conditions under which they tend to flourish or decay, can hardly be overestimated. As a contribution toward the dissemination of such knowledge, the collection just described possesses a high practical value.

"No large collection of well-executed drawings of cryptogamic plants has heretofore existed in this country; but by the assistance of Dr. M. C. Cooke, of London, and others, I have been able to supply the defect, and have formed a collection which will be of permanent value to mycological science in America. The drawings, nearly all of which were made from nature for the special purpose to which they are now destined, exhibit a high degree of delicacy and finish.

"Mushrooms in their composition more nearly resemble flesh than any other vegetable. Dr. Marcet proved that, like animals, they absorb a large quantity of oxygen, and give out in return carbonic acid, hydrogen, or azotic gas. Chemical analysis demonstrates the presence, in their structure, of the several components of which animal matter is formed, many containing sugar, gum, resin, fungic acid, various salts, albumen, adipocere, and ozmazone, which last 'is that principle which gives flavor to meat-gravy,' according to Dr. Badham.

"Fungi are applicable to other than culinary uses, though their most important use is the gastronomic one. To obviate the difficulty arising from the prejudice against the wholesomeness of any mushroom, Mr. Berkeley recommends a good quantity of bread to be eaten with them. He is of opinion that mushrooms are only indigestible when eaten alone or in imprudent quantity. Of course this remark applies equally to any sort of mushroom, though it is made with reference to the one in familiar use.

"As an indirect but very important article of diet, the tiny fungus, known as 'yeast,' stands pre-eminent. It is composed of globular cells, which produce other cells with incredible speed, and the interchange of fluids on either side of the membrane is the cause of the fermentation. German yeast is formed of the dried globules.

"The *Polyporus betulinus* makes very superior razor-strops, its substance containing minute crystals; the *Polyporus squamosus* is also good for this purpose, if cut from the tree in autumn, then flattened in a press, rubbed carefully with pumice, cut into slices, and each slice fastened to a wooden stretcher. The *Polyporus fomentarius* forms the amadou of commerce, formerly used only as 'German tinder,' but now applied—by, at any rate, one medical practitioner—in sheets to protect the backs of bed-ridden patients. Gleditsch relates that the poorer inhabitants of Franconia stitch it together, and make garments of it. *Polyporus ignarius* is used as snuff in the north of Asia. *Polyporus officinalis* was formerly used as medicine, but is so employed no longer. *Polyporus sulphureus* furnishes a useful dye. *Coprinus atramentarius* may be made into ink. *Amanita muscarius* furnishes poison for vermin, and is an ingredient in some intoxicating liquors. Wood impregnated with the metallic green spawn of the *Peziza* is of great value in the delicate inlaid work known as Tunbridge ware. A small fungus belonging to the *Ascomycetes* class, and known as ergot of rye, furnishes a powerful and useful medicine, though in the hands of the ignorant it is an extremely dangerous poison. Mr. Berkeley suggests that decayed fungus would form good manure. Such being the case, it would be well worth the trouble to let the laborers' children collect them and throw them into a heap, like dead leaves, for leaf mold; thus even the poisonous species might be utilized.

"*How to Grow Mushrooooms.*—Having received many communications asking for information in relation to mushroom culture, we append the following descriptive answer from the pen of Mr. William Saunders, Superintendent of the Propagating Gardens of this Department, who has given much practical consideration to the subject. Many persons suppose that there is a great difficulty in cultivating edible mushrooms, and they believe that there is a mysterious secret connected with their propagation known only to a few:

"The poisonous properties of many species of fungi, and the difficulty of distinguishing the good from the bad, militate against them, and render it necessary to be cautious in making them an article of food. Nevertheless, mushrooms are very generally esteemed when properly cooked, and are nutritious when used in moderation. Chemically they have more resemblance to flesh than any other vegetable. In some parts of Russia it is said that the peasantry depend on mushrooms and bread for the greater part of their sustenance. They employ about fifty kinds of fungi as food. In Rome there is an inspector of mushrooms, who attends the market as a guarantee for public safety; and, strange to say, our common edible mushroom (*Agaricus campestris*) is interdicted. Specimens of it brought to the fungus market are sent under escort and thrown into the Tiber.

"It appears from the remarks of mycologists that the majority of mushrooms are harmless; the poisonous varieties being the exception, the innoxious and esculent the rule. But the difficulty lies in the selection, as we have no definite guide to point out what sorts are, or what are not, poisonous. Even some of the wholesome kinds acquire noxious properties when grown under peculiar circumstances. Soaking in vinegar destroys many of the poisonous qualities, if present. Cooking also removes the deleterious properties from many that would be unsafe to be eaten in a raw state. Various tests have been recommended. The presence of a free acid has been considered a sign of harmlessness. This is found not to be conclusive, as many, good and bad, will redden litmus paper. Cooking them with a silver spoon, under the impression that, if bad, the spoon will change its color, is also an erroneous idea. Selecting by color has also its disadvantages. Many of the most noxious species are of a snowy whiteness, while others of a less tempting color are perfectly harmless; so that great care and experience are requisite to discriminate those that can be eaten with safety.

"The *Agaricus campestris*, or common mushroom, is the only species that is generally grown artificially. It is thus botanically described: Stipes (or stalk) two or three inches in length, white, solid, fleshy, furnished with an annular veil (a thin membraneous substance encircling the stalk). Pileus (cap, or edible part) fleshy, dry, convex, convexo-plane, white, changing from yellowish to brownish. Gills (thin parallel plates underside of the cap) free, ventricose (swelling unequally on one side) pink, changing to deep purplish brown. Flesh (internal substance) white.

"There are several species of the *Agaricus*, besides the preceding, and also a few varieties of the *A. campestris*, that are sometimes grown for the table. It is unnecessary to describe them here, as those who purchase spawn need be under little apprehension of receiving a spurious article; at least so far as my experience goes. I have never been disappointed in this respect. So far from there being any difficclty in growing them, I venture to say that not one in fifty who make the attempt will fail. Of course some little attention is requisite, as with everything else artifically circumstanced. A knowledge of the condition under which they are most plentifully found in nature will be of material assistance to the grower. In very dry seasons, mushrooms are most plentiful in low situations, on rather strong soils; on the contrary, should there be much wet, they are more abundant in uplands and drier localities. A continuance of warm, dry weather, followed by slight showers, and a hazy, still atmosphere, brings them most profusely. These considerations are worthy of being kept in mind in their artificial culture. There is no particular season for making a mushroom-bed. In winter it requires to be under cover, and in summer the difficulty lies in keeping it cool and moist. Autumn is perhaps the best season for making a bed out of doors; and, if a constant supply be an object, a bed should be made up in some spare cellar about the beginning of November.

"Before entering into the details of management, it may be useful to make a few remarks upon the propagation of spawn. Summer is the best time for performing this operation. Procure some horse-manure; if there is a sprinkling of short litter with it, so much the better; cow-dung and light loamy soil, or road scrapings, in about equal proportions; it is not particularly necessary that they should be in exact quantities. I mention this in passing, as an idea sometimes gets abroad, that unless everything is mathematically adjusted by number or weight, it would be folly to expect a satisfactory result. Wash these ingredients together with water into a thick mortar, and spread it out three inches in thickness in an open shed to dry. As soon as firm enough, cut it with a spade in squares of seven or eight inches, set them on edge, and turn them occasionally to facilitate their drying. When they will admit of being handled with safety, cut with a knife two or three holes, about two inches in diameter, little more than half through the brick, and fill each hole with good spawn, plastering it over with a portion of what was cut out. They should now be left until quite dry. Have ready a quantity of fermenting manure which has been well sweetened by frequent turnings. Spread a layer of this six or eight inches in thickness, and build the bricks on it with the spawned side uppermost, drawing the pile up to a point; then cover the whole with warm manure. A genial warmth of about sixty degrees will be sufficient to cause the spawn to run through the whole of the bricks. When this takes place, the process is ended. The brick can be laid aside in a dry place, and the spawn in them will keep good for years.

"Mushroom-beds out doors may be made of any material capable of producing a mild heat by fermentation. Stable-manure is best, taking long and short as it comes to hand, and tossing it into a heap to ferment. When it becomes sufficiently heated, turn it over, bringing the rougher portions into the center. This should be repeated until it is well mixed and equally rotted. The object is to bring the whole into an equal state of fermentation without rottenness, to drive off excessive moisture, and subdue the burning heat with the least possible loss of the essential gases. If a third part of old hot-bed manure is mixed with it, it will moderate the heat and give the bed a consistency that it would not otherwise possess. Having it in readiness, choose a spot for making the bed; if under the shade of a tree, so much the better. Mark out the ground four or five feet wide, and of a length to correspond with the quantity of manure. Commence by throwing in a layer of the least decayed portions of the dung; then build the whole up in a rounded ridge three feet high. It must be equally and firmly beat down, that it may produce a mild, equable heat. Pushing in a few stakes at intervals all round, and drawing these out occasionally, and at the same time feeling them with the hand, will afford a tolerable estimate of the interior warmth. The heat should never exceed ninety degrees after the bed is put up. If likely to get warmer than this, make holes all over it with a stout stake, and when the heat subsides to between seventy and eighty degrees, it is ready for planting the spawn. Beat the bed evenly all round, and insert the spawn just below the surface, in pieces the size of a hen's egg, twelve inches apart; then cover it over with a layer of strong, loamy soil two inches in thickness, beating it firmly and leaving it quite smooth. To prevent accident from overheating, it should be only partly soiled at first—say, half way up—covering the whole some days afterward. To prevent the soil from cracking in dry weather, a thin covering of short straw or hay may be thrown over it; very little watering will be necessary. When it is found requisite to moisten the surface, let water pass through a fine rose on the outside of the covering, which is preferable to applying it directly on the bed. Should the bed be made up about the middle of August, mushrooms may be expected toward the end of September, from six weeks to two months after spawning. When the nights become cold, the covering should be increased, and to guard against damp, choose a clear day, occasionally turn off the covering, remove all decaying matter, and when all is dry, cover as before. It will keep in bearing for two months or more, if the interior heat is preserved by additional covering.

"Various schemes may be resorted to for obtaining mushrooms in winter. Those who have a green-house may make a bed in the furnace-room, if they desire to do so, taking advantage of the heat that escapes from the furnace. A good supply may be had from a bed formed underneath the plant-stage, provided the drippings of water from the pots above be guarded against by boards or water-proof cloth. Portable boxes, three or four feet long, two feet wide, and one in depth, filled with horse-manure, and spawned in autumn, being set in a dry place, will, when soiled over in rotation, and placed in the warm end of a green-house, afford a moderate supply. Even good-sized flower pots may be thus prepared, and a few introduced at intervals. The equal temperature of an underground cellar or root-room is very suitable for the growth of this esculent. In such a place mushrooms may be had the whole year from successional beds without much trouble or expense. The best crop I ever saw was in beds on each side of a close shed, with a row of fermenting manure between them. The frequent turning over of the manure filled the place with an agreeable moisture, and obviated the necessity of watering. The ammonia disengaged by this process was also decidedly beneficial. Shelves four feet long and one in width, rising one above another, will be found economical where space is limited. Where an ample and constant supply is desired, it is better to erect a structure on purpose. This need not be a costly affair. A house thirty feet long, ten wide, and ten high to the ridge, built with timber, would not be expensive. Allowing three and a half feet on each side for beds, there would be three feet in the center for a path, underneath which a flue or hot-water pipes should be placed. By having a bed on the surface, there would be space for two tiers of shelves on each side, affording, in all, upward of six hundred square feet of surface for growing the crop. This would be sufficient for a constant supply the whole year. Means should be provided in the roof for light and ventilation. Four windows, three feet square each, would be sufficient for this purpose.

"The principal material for forming beds in winter, or at any season, on shelves, should consist of horse-manure, with a little short litter intermixed. As this is collected, spread it out thinly to dry, turning it over frequently to prevent violent heating. The object is to get it into a dry state without decomposition. When it is in this latter condition, commence making the bed by throwing in the manure to the depth of three or four inches, and beat it firm with the back of a spade, or what is more expeditious, with a flat, heavy board, having two handles to work it with. Proceed in this manner until there is a depth of ten inches or so, firmly beaten; then insert the spawn just below the surface as before. Insert the bulb of a thermometer into the bed, and should the heat rise above eighty degrees, bore holes eight or nine inches apart all over it. When the temperature is about seventy-five degrees, cover the surface with two inches of strong, turfy loam, well beaten, leaving the surface smooth and level. The atmospheric temperature may range from fifty to sixty degrees, with proportionate humidity. A sprinkling of short hay laid over the bed will keep it moist. Where it is found necessary to moisten the surface, apply the water on the hay, which is preferable to watering directly on the surface of the soil. Pass it through a syringe or fine-rosed watering-pot, observing to use the water a few degrees warmer than the temperature of the house. It is better to give it frequently than too much at a time. If duly attended to, mushrooms will be gathered in six or seven weeks, and keep in bearing for two or three months. An occasional watering with weak, clear manure-water will prolong their duration. In gathering the crop, the mushrooms should be *twisted* up as far as possible without disturbing the young ones around. When cut over, the remaining part of the stem is liable to hurt the others from its decomposition.

"*Edible Fungi.*—As it is highly important to be able to distinguish the edible from the poisonous fungi, I herewith submit a list of the former, as tested by one of the highest authorities on this subject, Dr. Curtis, of North Carolina:

"*Agaricus* (*Amanita*)—Casareus, strobiliformis, rubescens.

"*Lepiota.*—Procerus, rachodes, excoriatus, mastoideus.

"*Armillaria.*—Melleus.

"*Tricholoma.*—Russula, frumentaceus. hypopithyus, Columbetta, castus, albellus, consociatus, personatus.

"*Clytocybe.*—Nebularis, odorus, giganteus, cespitosus.

"*Collybia.*—Radicatus, esculentus.

"*Pleurotus.*—Ulmarius, tessulatus, Pometi, glandulosus, ostreatus, salignus.

"*Volvaria.*—Bombycinus, speciosus.

"*Clitopilus.*—Prunulus.

"*Pholiota.*—Squarrosus, mutabilis.

"*Psalliota* —Campestris, arvensis, amygdalinus, cretaceus, sylvaticus.

"*Coprinus.*—Comatus, atramentarius.

"*Cortinarius.*—Infractus, violaceus.

"*Cortinarius.*—Pholideus, cinnamomeus, castaneus.

"*Cigrophorus.*—Chrysodon, eburneus, pratensis.

"*Lactarius.*—Torminosus, insulsus, piperatus, deliciosus, volemus, subdulcis.

"*Russula.*—Adusta, lepida, virescens.

"*Russula.*—Ochroleuca alutacea.

"*Cantharellus.*—Cibarius.

"*Marasmius.*—Oreades, scorodonius.

"*Boletus.*—Luteus, elegans, flavidus, collinitus, granulatus, bovinus, subtomentosus, edulis, versipellis, scaber, castaneus.

"*Polpydorus* (1. *Mesopus.*)—Leucomelas, ovinus, poripes.

"*Merisma.*—Frondosus, cristatus, confluens, giganteus, sulphureus, berkeleii.

"*Fistulina.*—Hepatica.

"*Hydnum* (1. *Mesopus.*)—Imbricatum, subsquamosum, laevigatum, repandum, rufescens.

"*Merisma.*—Coralloides, caput-Medusæ.

"*Sparissis.*—Crispa, laminosa.

"*Clavaria* (*Ramaria.*)—Flava, botrytis, fastigiata, muscoides, tetragona, cristata, rugosa, uliginea, macropus, subtilis, pyxidata, aurea, formosa.

"*Tremella.*—Foliacea, mesenterica.

"Dr. Curtis says that hill and plain, mountain and valley, woods, fields, and pastures swarm with a profusion of good nutritious fungi, which are allowed to decay where they spring up, because people do not know how or are afraid to use them. 'By those of us who know their use, their value was appreciated, as never before, during the late war, when other food, especially meat, was scarce and dear. Then such persons as I have heard express a preference for mushrooms over meat had generally no need to lack grateful food, as it was easily had for the gathering, and within easy distance of their homes, if living in the country. Such was not always the case, however. I remember once, during the gloomy period when there had been a protracted drought, and fleshy fungi were to be found only in damp, shaded woods, and but few even there, I was unable to find enough of any one species for a meal, so, gathering of every kind, I brought home thirteen different kinds, had them all cooked together in one grand *pot pourri*, and made an excellent supper.'

"One important use to which several species of fungi can be applied is the manufacture of catsup. For this purpose, not only is the mushroom, *Agaricus campestris*, and the horse-mushroom, *Agaricus arvensis*, available, but also *Agaricus rubescens* is declared to be excellent for the purpose, and a delicious but pale extract is to be obtained from *Marasmius oreades*. Other species, as *Coprinus comatus* and *Coprinus atramentarius*, are also available, together with *Fistulina hepatica* and *Morcehella esculenta*. In some districts, when mushrooms are scarce, it is stated that almost any species, that will yield a dark juice, is without scruple mixed with the common mushroom, and, it should seem, without any bad consequence, except the deterioration of the catsup. There is an extensive manufacture of catsup conducted at Lubbenham, near Market Harborough; but the great difficulty appears to be the prevention of decomposition. Messrs. Perkins receive tons of mushrooms from every part of the kingdom, and they find, even in the same species, an immense difference in the quality and quantity of the produce. The price of mushrooms varies greatly with the season, ranging between one penny and sixpence per pound. Messrs. Perkins are very careful in their selection; but little discrimination is used by country manufacturers on a small scale, who use such doubtful species as *Agaricus lacrymabundus* with *Agaricus spadiceus*, and a host of allied species, which they characterize as nonpareils and champignons. In the eastern counties *Agaricus arvensis* has the preference for catsup."

SOILING CROPS—STALL FEEDING.

The necessity that will arise for keeping live stock *within* the owners' fences, from the change which must, within a few years, inevitably be made in our fence laws, makes it proper to say a few words upon the subject of "soiling crops," or of feeding stock in lots, barns, stables, or pens, instead of suffering them to roam unheeded over the commons, or even in large pastures.

No doubt, if timber could always remain plenty, farmers would be justified in wastefully using it in cross-fencing their different fields, and thus keep a very large capital invested in worm fences, solely for the purpose of protecting growing crops from the depredations of their own and their neighbors' cattle. But timber will not always remain plenty in any country, and in many counties of our own State it is even becoming very scarce, and fence-making is getting to be a troublesome and expensive luxury. Upon the subject of "Fencing and Fence Laws," in this volume, I have given data of costs and values, to show that many counties in Kentucky would do well to have the laws regarding fences changed at once.

If this is done, new modes of caring for live stock must be provided, one of which, everywhere adopted in the old countries of the world in regard to feeding cattle and preserving manures, is known by the name of "soiling crops." This means simply to cut the different crops and grasses in a green state, and to feed them when cut to stock on lots or in stalls. Experience has proven this to be the best and cheapest form of feed for all kinds of live stock, and also the best way to produce the very largest amount possible of home-made barn manures, as fertilizers for future crops. There is quite a variety of opinions as to what crops are best for "soiling." Without pretending to decide which is best, I will here give the system pursued by some excellent practical farmers, who have found that it will pay. Sow in the fall winter rye, at three or four different times, beginning early in September. The first sowing will do to cut green, and feed in the first week in April, and the three sowings will do to feed from them till May 10. Following the winter rye, sow either early oats or spring rye, as early in the spring as possible; put in double the seed or crops intended for "soiling," that are used on those for seeding. By the time the winter rye is consumed, feed on the spring rye or oats; following this with green cut clover, orchard grass, herds-grass, timothy, and millet, then green corn sown broadcast or in drills. Sweet corn makes excellent soiling fodder and tops. This, like all other corn, can be planted at different times, beginning very early in the spring, and continued at intervals until the 15th of July, or even the 25th of July, in some years. It is far better for soiling than the common corn. Barley and wheat each makes first class soiling crops, as do also pea-vines for cattle and sheep, and Italian rye grass, Hungarian grass, sapling clover, and lucerne for all kinds of stock. Even the common "ragweed" makes good "soiling" for both cattle and sheep, and chufas are probably better than corn for hogs.

For milk cows, no soiling food is better than sweet corn. They always eat it twenty-five per cent. better than the Western or Southern large corn. They eat more of the stalk, relish it better, and give larger yields of milk than when fed upon almost any other feed. In raising corn for fodder, it is best to drill it with a garden drill, not too thick, and harrow it cleanly before it comes up; after it gets a start, it will protect itself from grass, and will yield, on well-manured land, twenty-five tons to the acre.

If, in the rotation of "soiling crops" of any kind, a portion is left over, it always, if properly cared for, will make excellent hay for winter use. In raising sweet corn for seed, you cannot succeed by letting it stay in the field as other corn, and harvesting it when you get ready, nor can you do it by husking or shucking it when green and putting it in the bin. It must, when ripe, be dried quickly and thoroughly, which it will soon do in the field if the weather is suitable; if not, it must be gathered and put up in traces in a shed with plenty of air, where it will dry readily. It can also be spread, not more than six to ten inches thick, in the ear, before husking, on a dry floor, where it easily seasons. It then dries perfectly. If it is not used in this way it will mould, and the germ will not vegetate. It should be drilled, in planting, two bushels to the acre.

The only argument against soiling is the labor it gives over the old pasturage system; but this is relatively of very small importance, if we count in the cost of pasturage, the great loss of food, the tramping of land, the fencing of it, the running after the cattle, and the general negligence incident to other systems of feeding. A great advantage of soiling crops in July, August, and September (even where we have good pastures in May, June, and July), is, that it prevents stock from eating out our grasses and clover, and from tramping the roots so severely as to kill out all the plants which may be unprotected or inclined to be weakly. It thus gives them a chance to make fresh and vigorous roots in the early fall, and thereby adds greatly to their future efficiency both for pasturage and as fertilizers.

When fattening for market, all kinds of animals thrive and take on flesh most rapidly if not allowed too much exercise. Stall feeding and "soiling" act in this respect similarly; in fact, they practically mean the same thing. If our farmers would once experiment upon the plan of seeding crops, especially for soiling purposes, and then prepare lots or stalls in which these crops may be judiciously fed, they will see the great saving of food, labor, and fertilizers which will reward their exertions.

ADORNING THE HOMESTEAD.

The useful and the ornamental are both necessary to fill man's cup of happiness. The useful, to the eye of the miser, is what nature seems most to demand from man's labor; but to the eye of the artist and the highly gifted poet, the miser's god is of the earth earthy, and not to be compared with the heaven-born ideality of the sublime and beautiful. With the great Socrates, the sage philosopher, *the good, the beautiful, and the useful* ranked equally high in making up the perfection of human attainments. A man can labor all his days like a piece of machinery, and accomplish much upon the physical plane, but still remain poor upon the plane of morals and philosophy—the good and the beautiful.

The object of man's life on this sphere is to create an individuality and an earthly development of spirit growth, which is to be of use, and to cause pleasure and happiness in the great future. To do this, man must cultivate each of the thirty-six or more organs which he may have (phrenogically speaking) within his cranium, lest any one of them may become dwarfed or idiotized by want of use. If thus dwarfed, his individuality or self-hood becomes imperfectly developed, and will pass from this earth-life poorly prepared for better conditions in a future state.

The *good*, the *beautiful*, and the *useful* must all be cultivated; and every opportunity given us to advance the objects of our earth-mission should be seized upon and used to the very best possible advantage.

We are told by the author of the biblical cosmogony that man, when first brought on earth, was placed in a delightful garden, where flowers and fruits, and lovely birds and harmless animals, were all found in greatest abundance, to minister to his pleasures and happiness. And we are told that the good God, who doeth all things well, "planted a garden eastward in Eden," and that he "took man and put him in the garden of Eden to dress and to keep it." Here grew the loveliest and most beautiful trees, plants, herbs, the most charming flowers, and the richest fruits, all constituting a "Paradise" exactly suited for man in his high and perfect development, and such as could be enjoyable only to him in this development. The narrator tells of man's sad fall, and of the "curse put upon him;" he also tells how the Lord God drove man from the garden, and ordered him to make bread "in the sweat of his face," yet left with him all the fruits and trees and flowers of beauty, except the tree of knowledge and of life. The consequence was, that the love of the good and the beautiful was still left with man, designedly, no doubt, to be cultivated and made one of his greatest sources of future happiness. The great preacher says: "View the lilies of the field, they labor not, neither do they spin, yet Solomon, in all his glory, was not arrayed as one of these—" rating here the beauty of the flower greater than the work of man. The gentle and the tender flowers, the grand and majestic trees, the rich and luscious fruits, came with man from his first estate on earth (from the garden of Eden, if you please), and have ever been his companions in his pilgrimage on earth. They administer to his wants, elevate his thoughts, teach him lessons of beauty and of love, and ever impress upon his mind the great truth that all things earthly are transient, and last but for a day; but that beauty and loveliness never forsake the rough fate of man, be his career ever so short.

A farmer's and laborer's life is a period of continuous toil, yet it can be made to abound in happiness and pleasure, if we will but surround ourselves with things of this life which are beautiful and good. The homestead and the hearthstone are the local altars, upon which offerings must be laid that will give contentment and cheerfulness to the family. 'Tis here that the restraints of the world are unknown, and the selfishness of human nature is forgotten. Man is a sympathetic being, and always partakes more or less of his surroundings, be they evil or good, ugly or beautiful. Home, to give happiness, must be good; home, to give pleasure, must be beautiful. The cold and cheerless home but bespeaks the cold, cheerless, and selfish heart that is its possessor. The beautiful, well-adorned, and neatly-arranged home portrays the elegant, refined, and spiritually advanced possessor.

The belated and weary traveler, covered with dust and foot-sore, may find embosomed in the deep woods or in the parched desert the humble home surrounded by the tiny trellises of vines, or the sweet-smelling odor of the commonest flowers; these will appeal to him at once through his senses, and proclaim that here dwell hearts filled with humanity and love, and he will feel in safety and protection when he here calls for rest and food; but let the mansion be ever so large, yet bereft of all things attractive in the form of trees, of flowers, of shrubbery, and other adornments, then, cheerless and lonely in feeling, the traveler approaches with dread and doubt, for here his natural instincts tell him dwells the miser, the misanthrope, the uncouth human specimen, who sees nought of beauty in life, and feels that one of his own species, who by chance falls into his way, becomes a lawful object of prey; and well the traveler may pass by the lonely dwelling, for its owner, though he may be rich in the world's earthly pelf, is still undeveloped, is still poor, is still beggared, because he is ignorant of the *good* and the *beautiful*.

Children and women naturally love the refined and the beautiful. They love the home where grand trees, fine shrubbery, and lovely flowers grow. They rejoice in homes where lawns and gardens lend enchantment to their ideal happiness. Why, then, deprive them of these home-made pleasures, which are more or less within the reach of every housekeeper in the land? Why not plant a few trees for ornament, a good orchard, and some flowers to cheer their hearts, and to make home attachments greater? In many parts of America our people neglect these things, but in other places, be it said to the owners' praise, there are many highly-adorned homes, and well-appointed country seats. All homes in town or country should be made cheerful with flowers, shrubbery, trees, and gardens. If we have very little ground, then pot-plants and trellised vines from windows will give great relief; but if our grounds are sufficient, very little care and expense will make them most attractive.

In Europe the cultivation of flowers, and the planting of ornamental trees, vines, and shrubbery is not confined to the rich. In the dooryard of the most humble tiller of the soil may be seen parterres of flowers and clusters of shrubbery disputing your passage to the door; around which hang beautiful vines, clothed with the mantle of perpetual green, which, in summer, is spangled with fragrant flowers of the most pleasing colors; and in fall, covered with berries of the most brilliant hues. These are the pride of the wife, the grown daughters, and the young children, and, like the green verdure of the Emerald Isle, ever call to mind, when seen or mentioned elsewhere on earth, recollections of the dear old home. In this way the homes of the "father-land" are made to dwell forever in the hearts of the children.

In this God-favored land of ours, this land of wood and prairie, hills and dales, the all-wise Creator has carpeted our whole country with mantles of green plants, herbs, and flowers, with which we can ornament our homes at little or no cost, and has also filled our forests with the most magnificent trees, both for use and ornament, with which we can make lawns, shady groves, or lovely orchards, where we and our children may enjoy the cool shades in the heat of the day, and may at eventide listen to the sweet songsters in their branches, or the gentle murmur of the winds among their dense foliage. Here, too, will our sons and daughters learn elegance of taste, and watch the operations of nature in the development of plants, by means of the great laws which control matter in the universe. Let every housekeeper, then, in our State adorn his homestead; let him or her see that the hearthstone is made attractive to the dear ones of the family. Do this; be wise; and in the words of Solomon, let it be said of you, "my beloved is gone down into his garden to the beds of spices, to feed in the gardens, and gather lilies."

Remember the homestead, its evergreen bowers,
Its wide-spreading trees, and beautiful flowers;
'Twas our father who made it, now gone to his rest,
Our mother adorned it, who lives with the blest.

WHY WAIT?

A SHORT DIALOGUE BETWEEN DR. VERRY SHARP, A SCIENTIFIC FARMER, AND SOFTLY GREEN, ESQ., AN OLD FOGY PLANTER.

Green. Good morning, Dr. Sharp, I am rejoiced to see you I have heard such wonderful stories about your big crops of tobacco, wheat, and corn that I just want you to tell me all about it.

Sharp. Well, neighbor Green, I do not know anything strange to tell. I do nothing but cultivate my lands well, after I have put them in order, according to common sense rules. I keep my stock fat, and my tools all in their proper places under sheds. I believe that is all I do in farming.

G. But, Doctor, they tell me you raised last year thirty bushels of wheat to the acre, and I know that your corn last fall looked in the field like what I used to raise when I first came to Kentucky from Old Virginny, more than forty years ago. Yes, Doctor, and they say that your tobacco will weigh more than twelve hundred pounds to the acre this year.

Dr. S. Certainly that is true, but there is nothing strange in all that, I am sure.

G. Strange! Why, certainly 'tis all strange! I know I was always a harder worker than your father, and used to raise heap the biggest crops. I did that for thirty years after I come from the old country; but somehow or somehow else, the Devil has got into my dirt, so that I can't get more than half the crops I once did. The fact is, Doctor, I haven't got over twelve bushels of wheat and six barrels of corn and five hundred pounds of tobacco to the acre, for more than eight years; and I work that same land that I used to raise big crops upon, and I plough my corn five times now where I, in old times, only ploughed it three times, and sided it once.

Dr. S. Well, friend Green, there is nothing strange in all that; your lands are hungry, and you refuse to feed them.

G. Hungry! Doctor, who ever heard of lands being hungry! I fear that is some of that book-learnt farming that Squire Swift was talking about; only he talked about feeding the corn and wheat and oats and tobacco, and such things, but never said anything about feeding the land.. I listened to him a long time one day, but thought I would just wait till he found the *mouths* of all these things before I would try to feed them.

Dr. S. How long have you been waiting? Do you not take some good agricultural journal?

G. Why, bless your soul, Doctor! I've been waiting about seven years, and thinking all the time I would slip out and try some of the Squire's wild notions, when no one could find it out and laugh at me if I failed. As to those farming papers, I never did read but one or two of them in my life, because I couldn't see how one of these dressy fellows could sit in his rocking-chair, maybe a hundred miles from my plantation, and tell me how to farm, and that, too, when he never pulled off a sucker nor topped a plant. This book-farming, Doctor, I say, won't do.

Dr. S. Friend Green, did you not tell me that your land will not produce crops as it did forty years ago, and that you had seen my corn which was equal to what your land produced when it was new?

G. Certainly I did, Doctor, and that's what astonishes me so; how you, a college-bred boy, who never ploughed a day in your life, can come here on the old Henry place, that always was called the poorest farm in the county, and make better crops than I can on my rich grove tract. There certainly is some secret you have found out that we old planters have not learned. I have been watching and waiting these five years to see if I couldn't catch it.

Dr. S. There is no secret in it at all. I have read attentively the agricultural papers each week, and when I saw a good suggestion I experimented on it until I found out how to feed my lands so as to produce heavy crops each year.

G. There is more of that book-farming. I tell you, Doctor, it will not do. I heard all my life that "Morus Multicaulus Mulberries," "Durham Cows," "Multus Bolus Cotton Seed," "Steam Doctors," "Fice Dogs," "Fancy Cooking," and "Book-Farming" were all humbugs, and I have got to see the first man yet who can prove that it is not so. They are all wrong, Doctor. I know it.

Dr. S. Friend *Verry Soft*—excuse me, friend *Softly* I mean (I got to thinking and mixed your and my name together), now how can you know a thing that you have never tried and have had no experience of, and that, too, when you say you have been waiting five years to steal a chance to try an experiment in such way that your neighbors will not laugh at you? Why wait? I myself never wait. I study the elementary constituents of my land, and the substances which are contained in the crops I desire to cultivate, and if these, or any part of them, are lacking in my soil, I purchase chemical fertilizers containing the lacking constituents, and supply them to my soil, which I then cultivate well and leave the balance to nature, and I find that Providence has never yet failed to help me to most luxuriant crops when I thus acted.

G. Well, I declare there seems like some good sense in that; and you say you learn that from farming papers?

Dr. S. Certainly I do; besides, I read and attentively study the reports of the Commissioners of Agriculture, those of our own State, as well as those of other States and of the General Government; and in these I find words of wisdom, such as you can get nowhere else; for here are collated the experiments of practical men, farmers who read and think, and also of those of scientific men, those who study natural laws, and give us lessons of wisdom from their laboratories and from their offices. It is from these sources I learn how to farm, how to make my land yield two, three, and four times more per acre than yours—producing better crops, more perfect grain, which I can afford to sell at cheaper prices than you can, who have been waiting for five years to find out where are the *mouths* by which corn, wheat, and other plants are fed. Why wait any longer? Think, neighbor Green, for yourself; read as I have done; study nature's laws; feed your plants as you feed your stock, and then you will no longer complain of short crops and worn-out lands. If you continue *to wait*, you will be like Mr. Micawber, who never accomplished anything of value, because he was always "waiting for something to turn up."

G. Upon my life! Dr. Sharp, you talk like a man of sense. I am going straight home and subscribe for a good agricultural paper, and write to our State Commissioner of Agriculture for his valuable reports, and as soon as I can get posted up, will send for some of those fertilizers you spoke about, and feed my land and crops, so that they may be equal to any that can be raised, either by you or Squire Swift. You have taught me a good lesson, Dr. Sharp. I must see you again about these things, when I have learnt something more, and will not be ashamed of my ignorance and prejudice, as I now feel. I will go straight away and say to my neighbor, Billy Poor, why wait any longer for other people to think for us, when we had just as well begin to experiment for ourselves, and to think for ourselves too. I won't stay behind any longer; so good-bye, Doctor.

JAPANESE FARMING.

From the early tales told us by the geographers and missionaries, we have been accustomed to look upon the people of China, Japan, and Eastern Asia as half-civilized, semi-enlightened heathens, deserving only our pity and contempt; but recent investigations teach us that, so far from these people being untutored, semi-barbarous, they are fully as far advanced, if not farther, in all the arts and sciences which are conducive to man's support, in the production of either food or raiment, than are most European countries. A traveler in Japan gives the following sketch of a Japanese farm, which might be copied, with profit, by even our best farmers and gardeners. He says:

"We have a Japanese field before us, in the middle of October, with nothing but buckwheat upon it. The buckwheat is planted in rows, twenty-four to twenty-six inches apart, the intervening now vacant space has been sown in spring with small white turnip radishes, which have already been gathered. These intervening vacant spaces are now tilled with the hoe to the greatest depth attainable by the implement. A portion of the fresh earth is raked from the middle up to the buckwheat, which is now in full flower; a furrow is thus formed in the middle, in which rape is sown, or the grey winter pea, the seed being manured in the manner already described, and seed and manure afterward covered with a layer of earth. By the time the rape or the peas have grown one or two inches high, the buckwheat is ripe for cutting. A few days after the rows in which it stood are dug up, cleared, and sown with wheat or winter turnips. Thus crop follows crop the whole year through. The nature of the preceding crop is a matter of indifference, the selection of the succeeding one being determined by the store of nature, the season, and the requirements of the farm. If there is a deficiency of manure, the intervening rows are allowed to lie fallow until a sufficient quantity has been collected for them."

PRIVATE LIBRARIES.

The civilization of this age is the outgrowth of thought and inventions among men. In the ruder ages of the world there were but few original thinkers. The human intellect was trained more to the laws of aggression and self-defense than to philosophy, or to the arts and sciences. In those ages superstition took the place of wisdom, and muscular development and patient endurance were more prized than intellectual preeminence. A Hercules was more renowned than a Solon, and for his muscular prowess was placed among the deities of a superstitious people. Cadmus gave a change to man's status in the world by the discovery of letters. These letters in combinations led to the formation of permanent words and sentences, and then to written language. Necessity produced manuscripts, written upon papyrus or the bark of trees, and then on the parchment made of the skins of animals. The preservation of these led to book-making, and the preservation of manuscript books led to the formation of libraries.

Among the Greeks and Romans, as well as among other nations of remote antiquity, manuscript books were very costly, and libraries were exceedingly rare and valuable. Even in the Augustan or Golden Age of Rome private libraries were seldom met with, and choice books sold at almost fabulous prices. This state of things continued throughout Europe until the middle of the 15th century (1450), when Johannes Gutenberg invented movable types at Metz, in Germany, and in connection with Faust, printed the first book ever issued from a printing press. Very soon the invention of Gutenberg and Faust was known throughout Europe; and from that day private and public libraries began to be formed throughout Western Europe, and books to cheapen rapidly in price. The Latin and Greek classics, particularly the works of the Augustan age of Rome, and those of the age of Plato in Greece, soon found their way into print, and began to be read by the favored literati of that age. Their admirable philosophy sunk deep into the literature of Europe, and entirely changed the channels of human thought. The human mind thus enlarged began to develop into habits of original ideas, which soon became coined into essays and histories, and various philosophical and other works, which found their way among the people, and were gathered in small libraries throughout all the Western European nations. For more than 325 years this continued, until now the public and private libraries have become so numerous that more or less books are to be found upon the shelves of every family throughout Christendom. The public, national, and State libraries contain volumes by the hundreds of thousands, and the presses, under the impulse of steam engines, are throwing off books by the million every day in the year. The influence of this great avalanche of concentrated thought is most powerful among the 1,400,000,000 of people now inhabiting our globe. A literary aura, greater or less in its power, pervades every nation on the earth; and no people can be found who are not subject to the impulse of thought (though it may be in a very small degree), which emanates from the great maelstrom of European and American literature. It is felt in the centre of Africa, through the energy of our travelers, and throughout Asia and the isles of ocean, through the all-pervading influence of commerce. But it is in the countries in which the English, the German, and the French languages are spoken that the greatest passion for book-reading and book-writing prevail. And as these languages represent the most extensive literature, so they represent the highest civilization known to the human family.

Judged by all that indicates free thought, enlarged brain power, knowledge in the arts and sciences, and wisdom in philosophy, the people of the United States are the peers of the most favored inhabitants of the globe. Here we have all classes of literature and books to be found elsewhere in the world. Here live men of science and wisdom who are unexcelled. Here books are cheaper than in any other country, and libraries can be collected with more ease than elsewhere among men. Here in every family are to be found the elementary works which teach the basis of our advanced civilization. Here the illiterate are the exception, and not the rule. Yet even with us are to be found some persons, whose minds have not been opened to the bright illuminations of what is called a "book education." This is a sad acknowledgment, but still a truth. It but shows, however, that with all our public and private libraries we still need more, in order to give every individual in the land an opportunity to read and to learn. The great difference between men, as a general rule, consists more in education than natural endowments, and the mass of men and women progress faster through scholastic training than by inheritable excellences.

Public schools have done much to give the basis of learning, but private libraries and the newspaper and periodical press usually build the superstructure. A reading people becomes a thinking people, a thinking people becomes an inventive people, an inventive people becomes a progressive people, and progression is the car on which civilization travels upward and onward, in its great march toward universal toleration, and friendship, and brotherly love.

The ideal Republic of the Grecian sage, the millenium of the Hebrew creed, and the universal brotherhood of the Christian theology, are but different views of a perfect civilization, where Love is the ruling principle, and Justice is the chief executive officer. To reach this state of beatitude, man must outlive all superstitions, all prejudices, all evil-abnormal selfish desires, which are based upon undeveloped ignorance.

Free thought, free communications, free commerce, and freedom of action can alone bring man to the high position here foreshadowed. Education and intelligence will subdue the forces of nature to man's control, so that labor will come from the brain more than from the muscle. But to reach this, all must read, all must think, all must gain what Solomon so highly extols, "in all thy getting get wisdom."

Private libraries should be in every family, lest its members fall behind in the great race of progress, and, like the foolish virgins, will appear without oil in their lamps. The farmer, the merchant, the laboring man, and the mechanic, who has a small private library, will always find his sons and daughters intelligent, and prepared to fill their proper positions in life, able and courageous in meeting all the perplexities and troubles which may lie across their pathway.

To adorn and beautify the homestead makes it attractive and beloved by the inmates, and as these embellishments are beautiful to the eye, so is the library within the home the attraction of the intellect. Let every father and mother of a household, then, be they ever so humble and deficient in this world's pecuniary riches, provide a few books for the edification of their sons, their daughters, and themselves. It is like casting bread upon the waters that return *good* a thousand-fold. Do this, have your private library as large as you can sustain it, and your children and grandchildren will call your name blessed in the land.

SHEEP-BREEDING AND WOOL INDUSTRIES.

Probably no portion of the globe presents more advantages for sheep-breeding than the States of Kentucky and Tennessee. A temperate climate, an elevated, well-watered country, and good nutritious grasses, are the requisites for a good grazing country. All these Kentucky has in an eminent degree. For many centuries before the white races pushed their civilization west of the Alleghenies, and even before Columbus discovered the West Indies, if we can believe the tradition of the aboriginal inhabitants, the territory now known as Kentucky was held as a common pasturage-ground for the buffalo, the deer, the elk, the bear, &c., &c., from which all the surrounding Indian tribes drew their winter supplies of food and skins. The indigenous shrubs, grasses, and fruits grown here were unequaled by those of any other portion of the great Mississippi Valley.

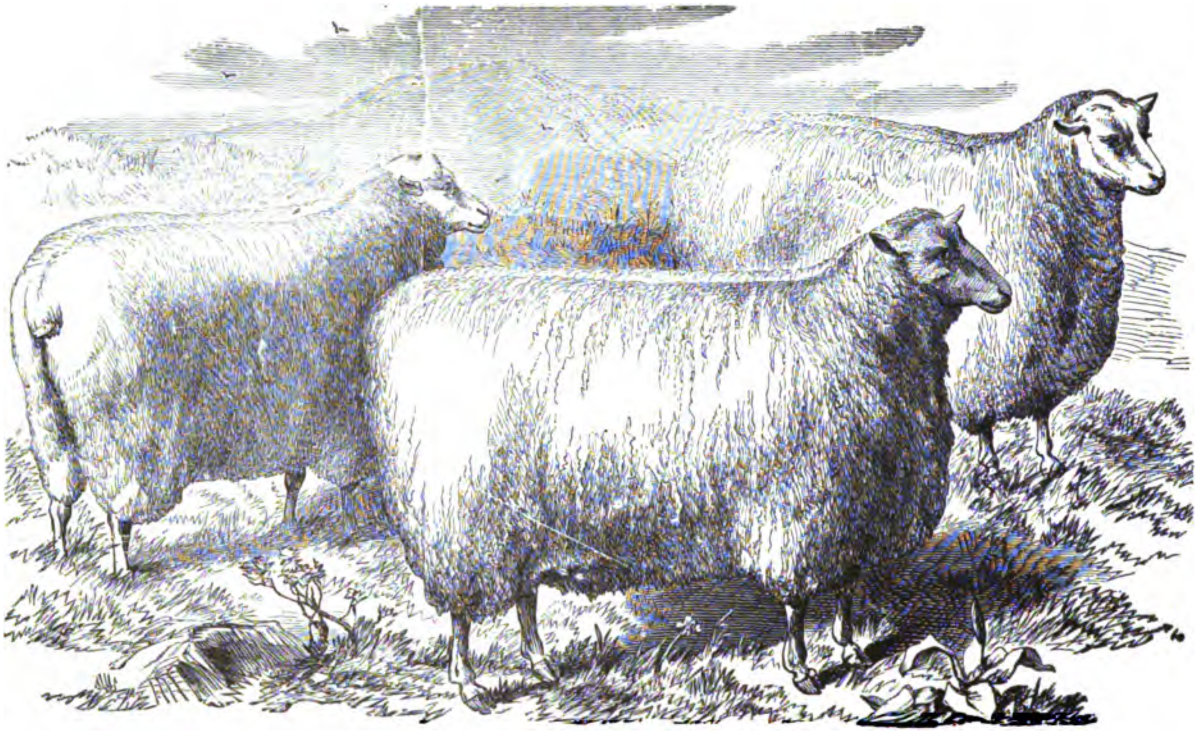
Since the advent of the Caucasian races, a marked superiority has been noticed in the physical development of all kinds of animals grown on these soils, even up to the human family, demonstrating the fact, that nowhere on earth are the elements of perfect animal outgrowth to be found in greater natural abundance than here on our own native soil. Corroborative of the theory that this latitude, and the limestone formations of our land surface, produce the hardest bones and the most solid muscles, we find the well-authenticated record that more than two thirds of the racing and trotting horses known to fame as successful above all others, and recorded in the turf registers, were and are natives of Kentucky; and the register of the United States military records, during the late war of the rebellion, show that Kentucky and Tennessee sent to the camps and field the largest, tallest, and best-developed men, on an average, that went into either army.

These facts are cited in order to show our people that no country can do more than ours in producing the best live stock of all kinds, and particularly is this fact apparent in the production of the largest sheep now known to exist on the continent, some of which, for instance, in Henry and Shelby counties, in this State, weigh from 400 to 460 pounds, and have furnished wool-clips of from 25 to 30 pounds. Our farmers need only to have their attention directed more particularly to the industry of sheep-breeding and wool-growing, in order to cause them to pay more care to this branch of agriculture, wherein lies a greater profit than in almost any other industry connected with soil-tillage in our country.

Hon. John L. Hayes, editor of "The Bulletin of the National Association of Wool Manufacturers," of Boston, Massachusetts, has written an exceedingly useful article of some length, and most exhaustive in its research of facts, in regard to "Sheep-breeding and the Wool Industry in our National Economy." This article is so replete with facts and figures, and apropos for the thorough examination of the American farmer, and written in such a plain, scholarly style, that I take great pleasure in transferring the entire article to these pages, for the especial service of all farmers, manufacturers, and merchants of our State. He says:

"Great truths never become trite by repetition. The mountains have stood unchanged in every outline of their gigantic features since the primeval cataclysms which uplifted them from the abyss; yet in winter and summer, spring and autumn, in storm and calm, in sunrise and sunset, how varying are they in aspect—eldest of created forms, yet for ever new! One sermon, pronounced eighteen centuries ago, embodies all that the ministers of the church have preached for succeeding ages. Yet the truths of Christianity will be always as new as the dawn of each day with the same recurring sun. In the political campaign just ended, the tens of thousands of speakers on either side have been effective only by repeating the few rallying principles of their respective parties, and eager audiences have never wearied of hearing again and again that which they most earnestly believed. The old lesson of line upon line, and precept upon precept, the old illustration of the perpetual water-drop upon the stone, must always be borne in mind by those who become weary in impressing upon others their convictions. If we have been presumptuous in the illustrations of the work we have taken in hand, it is because of our conviction that the truths which lie at the foundation of a wise political economy are among the great truths which demand perpetual enforcement. In the considerations above suggested, we find an excuse for discussing a topic which is neither original nor novel, but which involves the whole mission of this journal, viz: *The Part of the Wool Industry in our National Economy.*

"*Introductory Definitions.*—Economy means a well-ordered arrangement, and a national economy a well-ordered arrangement of the mate-



IMPROVED KENTUCKY SHEEP, bred by Col. Robert W. Scott, near Frankfort, Kentucky.
A two-year old ewe in front, weight 188 pounds; ram lamb 108 pounds; ewe lamb 106 pounds. Sketched by Vandusen, of New York.

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rial interests of a nation. We shall assume that the readers to whom we address ourselves, who are rather, in this case, the general public than specialists in the wool industry, will admit what is the universal instinct of intelligent nations—that a wise national economy demands that a nation should fix upon its own territory all those branches of industrial activity which suit its soil, climate, and commercial position, or, in other words, whose acquisition is authorized by the nature of things; that the end of a nation, like that of an individual, is its own perfection; and that, as a means to that perfection, it should aim to develop the resources of its soil and the activities of its people until they become in all necessary things independent and self-sufficient. The accomplishment of these objects is the true national economy. By the wool industry, we understand every thing which relates to the production and manipulation of wool. We discard the distinction between wool-growers and wool-manufacturers as unsound, both performing an equally important part in converting the products of the soil into fabrics. The grower converts the raw material, grass and grain, into fibre. The wool-scourer gives that fibre clean to the spinner; *he* furnishes the raw material, yarn, to the weaver; and the finished fabric of the latter is raw material for still other manufactures, as of cloth for the tailor, or felt for the paper-maker. The distinction, sometimes made between the producer and consumer of raw material, is therefore fallacious. The producer in every stage of the wool industry is both a producer and consumer of raw material; and the occupant of every stage has an equal claim with any other upon the national consideration.

"The relations of the occupants of the first stage in the wool industry—that of wool production and its incidents, mutton production and sheep-breeding—to the national economy naturally come first under consideration. Although in this branch of our subject we are peculiarly oppressed by the consciousness of an inability to add so little to what we have elsewhere said, familar facts may be more strongly impressed by a new statement.

Sheep Culture not Sectional.—We are first struck by the fact that wool production, with its incidents, unlike the production of any other raw textile material, can be advantageously pursued in some of its forms in every State—certainly within our own territory. Cotton can be grown only in the South; silk only in California and Kansas; but wool-growing is suited to every soil and climate except those of the tropics or extreme north. It would be difficult to find an industry more cosmopolitan, or to which national encouragement can be afforded with less risk of arousing sectional jealousies.

Cheapening of Animal Food.—Chief above all the relations of the wool industry to the national economy are the benefits which it confers upon the State in the supply or cheapening of animal food. European economists manifest grave apprehensions on account of the increasing cost of animal food in the older nations. The *savans* of the Society of Acclimation in France have for years labored to conquer the prejudices against horse flesh, and have finally succeeded in establishing its regular sale in the markets of Paris. They even regard the siege of Paris in some measure compensated by the fact that its necessities reconciled the Parisian masses to the use of the flesh of dogs, cats, and rats for food.

"Says the French Secretary of Finance, in reply to the allegation that duties on wool will increase the cost of clothing: 'No matter: they will encourage the growth of sheep, and diminish the cost of food. *Alimentation is more important than vestiture.*'

"Sheep, from the facility and rapidity with which they are matured, the rapidity of their increase, and their treble use for food, raiment, and manure, are the most available means of supplying a deficiency of animal food. Nature and the art of the breeder have made the sheep the most perfect machine in existence for converting grass and grain into flesh. France is turning her Merino sheep into flesh-producing animals of equal weight with the Southdowns, and maturing as early, yet retaining all the attributes of the Merino fleece. Germany, less wise, but with the same object of increasing the supply of animal food, is abandoning her splendid Merinos for the English mutton races. The superiority of the sheep as a meat-producing animal has been conclusively demonstrated by experiment. It has been proved that seventy-five pounds of food (be it hay, corn, or turnips) will make as many pounds of mutton as one hundred pounds of the same will of beef, and that when ready for the butcher, the 'fifth,' or waste quarter—the offal parts of the sheep—will be three per cent. less than that of an ox or cow; so that, by this showing, the weight of food required to produce seven hundred and thirty pounds of beef would make one thousand pounds of mutton. When we consider the positive saving in the use of mutton over all other meat, its superior nutritiousness, and the facility with which it is digested, added to the fact that of all animals the sheep is easiest fed, we need not wonder that England, with its dense population and manufacturing cities, has been compelled to cultivate sheep up to the absolute capacity of her high-priced lands, and to attain the enormous number of 34,532,000, yielding an annual produce of over £30,000,000.

"In England the indispensable necessities of its people are sufficient to stimulate the production of sheep. In this country the increase of sheep has been aided by the protective duties on wool. Thus we are able to draw a supply of mutton from thirty-five millions of sheep. The supply of pure mutton sheep—those of English blood declining for a time by the free admission of Canada combing-wools under the reciprocity treaty—was revived by the protective duties on combing-wools, under the tariff of 1867, and is now having a rapidly increased extension. The quality of mutton in all our markets has improved. It is daily increasing in popular demand. Where hundreds of sheep were sold in the Brighton market twenty years ago, there are now sold thousands. In the markets of New York, where sheep, a few years since, were slaughtered solely for their pelts and tallows, more time is required of the butchers to supply the demand for mutton than for all other meats; and the returns of these markets show mutton to be worth from two to five cents more than beef. The consumption of beef for our armies during the war seriously diminished the supply of cattle, which required years to repair. The sheep husbandry, so capable of rapid increase, stimulated by the extraordinary activity of the wool manufacture during the war, filled the void in the beef production, and kept the prices of animal food within reasonable limits; for the abundance of mutton kept down the prices not only of that commodity, but of all animal food. The benefits of this diminished cost of sustenance to every individual of our population has never been properly estimated. The cost of animal food to our population is certainly ten times that of wool clothing, which is but four dollars per head. Assuming that the whole duty on cloth is a tax on the consumer, and that the sheep husbandry, and consequent supply of mutton, are stimulated by protection, we may safely conclude that the whole duty on the cloth is reimbursed to the consumer by the diminished price of food resulting from the protection of wool. No legislation can wisely disregard this relation of the wool industry to the national economy.

"*Sheep Husbandry Improves the Land.*—Next in importance are the relations of sheep husbandry to an improved system of agriculture. These considerations apply much less to the simply pastoral husbandry, like that of California and Texas, than to sheep culture pursued as a branch of a mixed husbandry. Sheep are the only animals which do not exhaust the land upon which they feed, but permanently improve it. Horned cattle, especially cows in milk, by continued grazing, ultimately exhaust the pastures of their phosphates In England, the pastures of the county of Chester, famous as a cheese district, are only kept up by the constant use of bone-dust. Sheep, on the other hand, through the peculiar nutritiousness of their manure, and the facility with which it is distributed, are found to be the most economical and certain means of constantly renewing the productiveness of the land. Mr. Mechi, the most famous of the living scientific farmers of England, estimates that fifteen hundred sheep folded on an acre of land for twenty-four days, or one hundred sheep for fifteen days, would manure the land sufficiently to carry it through four years' rotation. In the counties of Dorsetshire and Sussex, where the Down ewes are fed in summer on the hill grass during the day, and at night are folded on the arable without food, the value of the manure is set down at one fourth the value of the sheep. By the combination of sheep husbandry with wheat culture, lands in England which, in the time of Elizabeth, produced, on an average, six and a half bushels of wheat per acre, produce now over thirty bushels. For these reasons, the recent practical writers in the Journal of the Royal Agricultural Society of England pronounce that, while there is no profit in growing sheep in England simply for their mutton and wool, sheep husbandry is still an indispensable necessity as the sole means of keeping up the land. Fortunately, we are able to find recent illustrations at home of the point above asserted.

"*Facts in America.*—The eminent agriculturist, Mr. George Geddes, of Onondaga county, New York, in an article written at our request, and published in the New York Weekly Tribune of September, 1876, has given the results of the sheep culture in mixed husbandry attained by the late William Chamberlain, of Dutchess county, New York.

"In 1840, Mr. Chamberlain purchased a farm in Red Hook, New York, of three hundred and eighty acres, which had been used so long to raise hay for sale that it was worn out. The hay crop of 1841 was seventeen loads; forty acres of rye gave ten bushels to the acre; twenty five acres of corn averaged twenty bushels to the acre; the remainder of the farm was pasture, and proved equal to the raising of one span of horses, two pairs of oxen, and one cow. The land was so exhausted that it would not raise red clover. The so-called commercial manures were tried with but little advantage; and then Mr. Chamberlain resolved to test the Spanish proverb: 'The hoof of the sheep is golden.' By using sheep as manufacturers of grain, hay, cornstalk straw, swamp muck, leaves, and weeds into manure, he had, in 1844, not only restored this worn-out farm to its original fertility, but made it so productive that its crops would be satisfactory even in Ohio.

"The account of the crops in 1864 showed six hundred tons of hay; forty acres of Indian corn, estimated to yield fifty bushels to the acre; wheat, for which the land is not well adapted, but the best crop with which to sow timothy and clover seed, thirty acres, averaging fifteen bushels; thirty acres of oats, eight acres of roots, and the pasturage of three hundred sheep, with the teams, cows, &c., necessary to carry on the farm and to supply the families on it with milk and butter.

"Mr. Chamberlain's plan, when he first commenced making manure by using sheep, was to spread it thinly, so as to go over all the surface he could, and have enough to make clover grow; and he said that when he had brought his land to where it would produce red clover, thenceforth improvement was easy and rapid. The sheep not only gave the first impulse, but were all the time depended upon as the chief manuring power.

"Mr. Geddes adds his own experience in raising sheep for many years in connection with grain. He says: 'With about one sheep to the acre of cultivated land, pasture, and meadow, we raise more bushels of grain on the average than we did when we had no sheep to manufacture our coarse forage into manure, and to enrich our pastures to prepare them for grain crops. While producing more crops on less acres, and at less cost than we did before we kept sheep, and, at the same time constantly improving our land, we have the wool and mutton from our sheep in addition.' These facts are conclusive as to the superior profitableness of sheep in mixed husbandry, and especially as an adjunct to wheat farming. We may add, that these considerations have recently attracted serious attention in some older States. The Maine State Board of Agriculture have discussed the subject with great earnestness; and, in their last report, have published elaborate articles showing that an extension of sheep or mutton-growing is of the first necessity to the agriculture of that State.

"*Promotes the Highest Arts of Agriculture.*—Sheep husbandry in its higher branches is eminently promotive of the individual culture of those who pursue it, and is thus conducive to the intellectual advancement of the nation. It is well recognized that the simple culture of a single crop, whether of corn or cotton, is the lowest form of agriculture; but, when combined with the culture of animals, farming assumes a higher phase. The culture of sheep, especially connected with wheat-growing, has distinct advantages over other forms of stock-raising. One advantage, though not directly bearing upon the immediate point in question, is that the ewe gives two dividends each year—her fleeces and her lambs. The males give larger fleeces, and go to market earlier. The beef-producing animals give no dividends, and the grower must go on adding his expenses till the end of their lives, when in one gross sum he must find his compensation if he can. To this may be added that, in mutton production, the capital invested may be turned over two or three times during the same period that the same capital is employed in beef-raising. This, however, is beside our subject. We have heard a striking advantage of wheat and sheep-growing over dairy farming commented upon by practical farmers. In dairy farming there is an unvarying routine of providing food for stock, selling the dairy products, and shoveling manure. There is no let up, no vacation to the farmer. In wheat and sheep farming combined, there are two short periods of excessive activity—the harvesting and lambing seasons; in the intervals, long periods for other pursuits or intellectual culture. Hence this has been called the aristocracy of farming.

"The breeding of animals is now recognized as among the greatest of the creative arts. Professor Agassiz says enthusiastically of the stock-breeders of the present day: 'The practical realization of a theoretical acquisition has led them to make science the foundation of their business. From very empirical workmen they have raised themselves to be a class of thinking workers, who, as regards mental range, will very soon surpass every other industrial class, and before long will give society a totally new impress.'

"No class of stock-growers have done so much to merit this high praise as the breeders of sheep. This species being so plastic in its character that the breeder, according to Lord Somerville's celebrated saying, 'may chalk out upon a wall a form perfect in itself, and then give it existence,' presents the most signal illustrations of the modern doctrine of evolution. The breeder has become a veritable creator. The products of his art have the permanency of primeval species. There are convincing reasons for believing that the precious Merino was converted by the art of man from the coarsest of the primeval sheep, the hair being dropped, and the underlying down, found still in the rudest of the ovine races, having been developed into fine wool. All the most valuable long-wooled races of England, so distinct in their characters, have been developed by human agency. The Merino of Spain has been converted on the one hand to the electoral race of Germany, and the sheep Naz of France; producing fleeces of the utmost fineness, but weighing not more than a pound and a half, and with a length of fibre of less than an inch; and, on the other, to the Rambouillet sheep, producing fleeces of thirty pounds weight, with a length of five inches. New and unexpected qualities appear from time to time through accident, which the breeder turns to advantage, such as the silky Mauchamp wool, rivaling the Cashmere, or even modifications of the skeleton form of the animal, as in the Ancon or *otter* sheep of Rhode Island, with limbs so formed that it cannot jump fences. A new attribute attained by the breeder's foresight, or his judicious application of happy accidents, may be of priceless value. Thence the immense money value of the best stock sheep—a value enhanced by the rapidity with which the regenerating influence of the male propagates itself. The influence of one buck in three or four years may raise the wool product of a flock of a thousand sheep from five to ten pounds for each individual. There are cases which justify this statement. Thus, even in the time of the Emperor Tiberius, Spanish rams were sold for a talent—about a thousand dollars of our money. The ram-letting of two animals by Bakewell, the producer of the new Leicester sheep, produced in one season twelve hundred guineas. Our Mr. Hammond sold his bucks for five thousand dollars each; and even in Australia, where perfection in sheep-breeding might be supposed to be everywhere prevalent, a ram at a sheep auction in Melbourne, during the present year, 'after the keenest competition, was knocked down at three hundred and fifty-five guineas.'

" In the history of agriculture no names stand so prominent as great benefactors as those of Robert Bakewell, the creator of the new Leicester; John Ellman and Jonas Mills, the improvers of the Southdowns; Von Thaer and the Duke of Lecknowsky, in Germany, the improvers of the Merinos; Daubenton, the associate of Buffon, the founder of the French Merino; Mr. McArthur, the creator of the Australian sheep husbandry; Edwin Hammond, of Vermont, mainly the originator of the American Merino. The nobility of sheep-breeding is recognized in all the advanced nations. The Empress Eugenie took the flock of Rambouillet under her special protection. The Queen of England takes pride in the choice flocks which adorn her parks. The English nobleman values the prizes for his perfected Southdowns or Lincolns above all the honors of the turf. And, at a dinner of the landed gentry, the topic of sheep and turnips takes precedence of all other table talk. Such recognitions lift the creative work of the sheep-breeder to the rank of the highest of the arts of agriculture, and make its acquisition not only a source of national emolument, but an object of national pride.

"*A Means of Settling New Territories.*—Pastoral sheep husbandry is of the first importance to the nation as the most effective means of settling and improving the vast unoccupied lands of the new or vacant States of the West and South. Of all the products of agriculture, wool is most capable of transportation; or, in other words, the greatest value can be placed in the smallest bulk, in a form liable to receive the least injury in the friction of transportation. When the freight of wheat from Chicago to the seaboard costs eighty per cent. of its value, of pork thirty per cent., and of beef twenty-one per cent., that of wool is but four per cent.; wool, therefore, may be grown with profit in the districts of the remotest interior favorable to its production.

"*Sheep in Russia.*—No industrial movement of the present century is more marked than the development of the pastoral sheep husbandry, upon a vast scale, in new countries, distant from the markets where the products are sold. The manufacturing centres of Europe derive their chief supply from distant and newly occupied regions. The wool production of England remains stationary; that of Germany, Austria, and France is declining. Russia alone, among the European nations, with her vast unoccupied lands, is extending her sheep husbandry as the readiest means of occupying her distant possessions. The numbers of her sheep in the Russian empire reach the enormous figure of 65,387,000. Single proprietors have not less than 400,000 animals. While Great Britain has 133 sheep to each hundred inhabitants, France 97, and Prussia 93, the whole Russian empire has 81, and certain provinces, as those of Central Asia, have 565 sheep for each hundred inhabitants. The culture of sheep receives the most watchful care from this eminently paternal government. This was well illustrated at the International Exposition. The choicest exhibit was made by an Archduchess. The imperial commissioner, himself a privy councilor, would not trust the explanation of the wool exhibits for awards to a subordinate, declaring, as he pointed out the characteristics of each exhibit with striking minuteness of information, that 'this industry was peculiarly under the care of his government.'

"*Argentine Republic.*—Although the Argentine Republic did not seriously undertake the culture of Merinos until 1826, she numbers now 51,500,260 sheep, producing 216,000,000 pounds of wool. *Estancia* after *estancia*, district after district, has passed into the hands of the sheep farmer. The value of sheep has increased ten-fold within twenty years, and of land in the same ratio. The shepherds, from the poorest classes of English and Irish immigrants, have become wealthy proprietors, and the republic, through her sheep mainly, has become the most prosperous of the States of South America.

"*Australia.*—But Australia presents the most striking example of the influences of sheep husbandry upon civilization. In 1803, Captain McArthur brought a few Merinos, from the choice flock of George III, to New South Wales. In 1810, the export of wool was 167 pounds. In 1875, the export of wool from New South Wales was 216,000 bales, of the value in the London market of between five and a half and six million pounds sterling. The number of sheep in the seven colonies of Australia, in 1874, was 61,684,127. The exhibits of wool from Australia, at the Exposition at Philadelphia, were the finest ever before made. Hardly less conspicuous than the wool exhibits were the evidences of wealth and progress in all the arts, the variety of products of the mine and the soil, and the illustrations of social and educational improvement, which made the exhibit from these distant colonies among the most attractive in the exhibition. The chief instrument of this civilization was the sheep. In the words of one of her commissioners, 'Although Australia may freely boast of the unequaled richness and variety of her mineral productions, of the large returns and great fortunes amassed from her gold fields, yet nothing approaches the wool industry in importance.' The close of this century will doubtless see these separate and dependent colonies incorporated into an independent republic, and the extraordinary fact will be shown of an empire founded by the humble sheep!

"*Relations to Settlement in the United States.*—It is only within the last ten years that the system of pastoral wool husbandry, as an independent industry—after the methods of Australia, the Argentine Republic, and Russia—has been undertaken in this country. The attempts in Texas were arrested by the war of the rebellion. The tariff of 1867, by excluding the over-production of the southern hemisphere, firmly established the pastoral sheep husbandry upon the Pacific coast. This year, from the returns which we have, California will produce fifty-one million pounds of wool; while, in 1860, the whole country produced, according to the census returns, but sixty thousand pounds. The pioneer wool grower in California, Colonel Hollister, having led a company of emigrants to that State in 1852, saw, at the head of San Francisco Bay, a band of some two thousand Mexican sheep herded by two dogs, with no man in view. 'If dogs can do this,' said the Colonel to himself, 'what may not men do with sheep in a country like this, where grazing is perpetual, where no shelter is required, and where the natural increase is one hundred per cent. annually?' Starting, in 1853, with eight hundred sheep, secured for himself from three thousand brought into California from Ohio in 1852, he formed a partnership with the Messrs. Diblee Brothers, who had been successful wool-growers in Los Angeles county. In 1863, the partners bought the great Lompoc rancho for sixty thousand dollars, and stocked it with ten thousand sheep. In 1874, the landed property was worth a million and a half of dollars—all the result of sixty thousand dollars originally invested, and ten thousand sheep well handled. The product of four hundred pure Merino ewes purchased in 1862 was, in 1875, fourteen thousand one hundred and ninety-three pure Merino ewes, descended from the parent band, in addition to the males reared. In 1874, the sales of wool and sheep amounted to one hundred and twenty-four thousand two hundred and forty-nine dollars. With all these splendid results, in the words of his biographer, Colonel Ostis, 'Colonel Hollister himself looks upon sheep husbandry, not as an *exclusive* interest, to be prosecuted indefinitely on the extensive scale which now characterizes the pursuit, but rather as a pioneer industry for a new country, useful to bridge over the gap between a sparse and a dense population, and which ought to be gradually retired before the advance of settlement and the advent of the plough.'

"These words indicate precisely the part which the pastoral sheep husbandry plays in the settlement of a country. The sheep-grower moves to new lands, after opening those first occupied to permanent agriculture. Sheep husbandry will advance from the foot-hills of California to the *parks* of the Rocky Mountains; and regions as wide as Australia or the Pampas of South America, supplied with aromatic grasses, preserving their nutritiousness during winter, lie open for pasturage between the Missouri and the Pacific. To give but one illustration The Valley of the Republican is two hundred and fifty miles long and one hundred miles wide; containing two thousand five hundred square miles, or sixteen millions of acres. 'There is not a rod of these sixteen million square acres,' says Dr. Latham, 'that is not the finest of grazing, and which is not covered with a luxuriant growth of blue buffalo and gramma grasses.' He continues: 'New York, Pennsylvania, Ohio, Michigan, and California are the five largest stock and wool-growing States, aggregating sixteen million sheep. The sixteen million acres in one valley would graze all the sheep of these States, and still leave millions of acres of grasses untouched.' Texas and other Southern States have millions of acres nearer at hand, with advantages of winter grazing equal to those of Australia. We have before us the careful estimates of the most experienced flock-masters in this country, proving that sheep husbandry can be profitably conducted in Texas on the same gigantic scale as in Australia and Southern Russia. Who will deny, in view of these facts, that the wool industry performs the high part which we claim for it in our national economy?

"*Relations of Domestic Wool to Domestic Manufacture.*—The domestic production of wool is highly promotive of the perfection and abundance of the wool manufactures of a nation. As a rule, the characteristic wool manufactures of the leading nations have been determined by the abundance and peculiarities of their own raw material. Turkey, having no clothing wool, makes but few, and exports no cloths; but she sends her beautiful Smyrna carpets and rugs to all the wealthy markets of the world, for the simple reason that she has in abundance the admirable carpet wool produced by the barbarous or fat-tailed sheep inherited from the remotest ages. It may be said that the United States excels in the manufacture of carpets, although producing no carpet wools. This exception to the general rule is due to the fact that American ingenuity, developed in other branches of the textile industry, first successfully achieves the manufacture of carpets by the power loom.

"England, the creator of the long combing-wool sheep, and by far the first country in the world in their production, was the inventor of the countless dress fabrics for common consumption made from this fibre. It is first through these fabrics, the products of the peculiar fibre of her own sheep, that England ranks as the first wool-manufacturing nation in the world; and, secondly, that she has practically the command and the first choice of the products of her colonies, the fine wools of Australia and the Cape of Good Hope, although continental manufacturers apparently have free admission to the London markets of the Cape and Australian wools. The substantial advantages which the

English have in the command and first choice of these wools in their own market, is well recognized by other European manufacturers.

"Germany, through the genius of her breeders and the advantages of a dry climate and not too fertile soil, having produced the electoral fine-wooled sheep, immediately availed herself of this domestic possession to give a new character to woolen cloths. The light and fine German broadcloths became the rivals of the more substantial and less pliable West of England cloths, which formerly had undisturbed sway, and still dispute supremacy with them at the International Expositions.

"France furnishes a still more remarkable illustration of the influence of a domestic wool production. It is well known that the most luxurious woolen dress goods for fashionable consumption, such as all-merinos, Cashmeres, serges, matelasses, baskets, challis, besides countless novelties appearing each recurring season, are of French fabrication. France established her prestige in this fabrication through her possession of the Merino combing-wools, which she in fact created. The directors of the national sheepfolds of France, after obtaining Merinos from Spain, instead of pursuing the German methods of breeding, aimed to increase the size of the frame and the weight of the fleece of the animal. With this increased size and weight, there was developed a corresponding length of fibre, and a Merino combing-wool was for the first time created. The French manufacturers were the first to avail themselves of this new property of wool, which their own territory supplied. National pride stimulated them to create original fabrics from the new material furnished from domestic sources. They invented all the fabrics above described, and more recently worsted coatings; in a word, all the woolen stuffs of the nineteenth century, which distinguish themselves in their physiognomy from the tissues of the preceding centuries. To France must be accorded the honor of impressing the most characteristic features, both of sheep husbandry and wool manufacture of the present age. This was the result of the combined possession of sheep husbandry and wool manufacture by a nation having a genius for the arts, and at the same time always fully appreciating the relations of the wool industry to a national economy.

"In further illustration of this branch of our subject, we may compare two other European nations: one possessing great disadvantages in a deficiency of experience, but with abundant flocks; the other having the highest advantages of experience and traditionary skill in manufacture, but without sheep—Russia and the Netherlands.

"The first cloth factory in Russia was founded by Peter the Great, solely to provide cloth for his troops, in 1698, when Netherlands was at the height of its manufacturing prosperity. In spite of the encouragement of the government, the cloth manufacture made scarcely any progress during the last century; not improbably because Russia had then no Merino wools. In 1820, prohibitory duties were placed on black and green cloths, and very high duties on other cloths. We infer also, though we have no exact data on this point, that the Merino sheep husbandry began at this period to receive expansion. From this period the wool manufacture made rapid strides. In 1871, the factories in the empire numbered 1,339; the workmen, 121,070; and the value of the production reached the sum of 77,017,600 roubles. To this is to be added a much more extended woolen industry—the home fabrication of cloth by the peasants. 'The industry of wool,' say the Russian statisticians, 'suffices largely for the necessities of our vast comsumption, and allows us even to export a part of our products to Asia.' The excellence and variety of the Russian wool products were fully demonstrated at our International Exposition. We need not add that the raw material of these products is furnished to Russia by her sixty-five million sheep, twelve million of which are Merinos. These facts show that it is by developing all her internal resources, and making her industries independent of all foreign supplies, that this vast self-contained empire dares to place herself, as she is at this moment doing, in defiance of all the great powers of Europe.

"Netherlands in the sixteenth century was the chief seat of the wool manufacture of the world. Then she absorbed the wool product of Spain and England. Without flocks, her wool industry has lost its importance, and in the poor displays at the exhibitions of Paris and Philadelphia there were but few traces of its former splendors. Switzerland, distinguished as she is in the silk manufacture, has no sheep and no woolen industry. Belgium, which has no sheep, but a very considerable wool industry, might seem to contradict our position. But with some few notable exceptions the Belgian cloth industry is characterized by its cheapness, and the use of the weakest and cheapest of foreign wools, which are sure to betray themselves in the fabrics.

"The wool manufacture of the United States is conspicuously dependent upon our domestic wool production. It was hardly established until the introduction and rapidly increased culture of the Spanish Merino in the decade of 1810 and 1820. It was modified by the introduction of the Saxon sheep in 1824–'26, and still again by subsequent changes in the general character of American wools. The two branches of the wool industry have always stepped together, though unconsciously, quickened or retarded by the same general influences. As the flocks spread in the new States, the mills were planted in their midst—not clustered in few centres as in Europe, but broadly scattered, like sheep feeding in a wide pasture. In the State of Ohio, the first of the wool-producing States, there are in present operation 261 sets of woolen machinery, distributed among 187 mills, and these mills distributed among 157 counties of the State. Some of the other Western States, all of which are eminently wool-growing States, have establishments and sets of machinery as follows:

STATES.	Establishments.	No. of sets of cards reported.	Mills, capacity not given.
California	10	59	2
Illinois	99	192	13
Indiana	157	215	33
Iowa	98	118	20
Michigan	55	55	20
Missouri	57	69	19
Oregon	9	22	1
Wisconsin	67	72	21

"All these mills use, exclusively, American wool, and almost universally the wool produced in their immediate neighborhood. It would be safe to say, that not one of these mills would have been established but for the contiguous flocks, and that, if forced to seek imported wool, each one would stop.

"The gain to the manufacturer and wool-grower from the contiguity of the flocks to the mill, and the mills to the consumer, is immense. There are savings of transportation, facilities for selection and purchasing, and conveniences, both to the manufacturer and wool-grower, in the direct exchange of cloth for wool. We have before us the individual returns of each one of the mills above enumerated. The mills are most of them small, from one to two sets in capacity. The remarks attached to so many of the returns, such as 'sell our own goods at the mill,' 'goods made for home consumption,' etc., show how they directly supply the necessities of their immediate neighborhoods, and what a saving is effected in transportation and dispensing with the middlemen. While the judges in the group of woolens at the Centennial were making their examination of exhibits for awards, their attention was directed to cloths, principally fancy cassimeres, exhibited by a mill of Oregon, of twelve sets, and, therefore, of very considerable magnitude. The styles, designs, and fabrication were excellent, as well as the quality of the wool. The significant fact about these goods was the inconceivably low prices at which they were marked, making them the cheapest, for their quality, of any in the Exposition. The explanation of this phenomenon was, that the cost of wool to the Oregon manufacturer, produced from flocks grown immediately around his mill, was about half that paid by the Eastern manufacturer. There was a saving of middlemen's profits, and the transportation across the continent. The official award made by the judges expressly recognizes these facts.

"The consumption of domestic wool is not confined to the Western manufacturer. All our manufacturers prefer American wools, at the same price, to foreign wools even nearly resembling them in quality. In view of the widely and erroneously asserted statement of the importance of extending our importation of foreign wools, we cannot too often repeat the results of the census statistics of 1870, relative to wool consumption in our woolen mills proper—those producing cloths, blankets, flannels, &c.

Domestic wool used	154,767,095
Foreign	17,311,824
Cotton	17,571,929
Shoddy	19,392,062
Total material	209,022,910 lbs.

"Thus the foreign wool consumed in our cloth mills is only ten per cent. of the whole wool used, and is of less importance than the cotton and shoddy which enter into their production. These figures are sufficient to show that the very foundation of our cloth manufacture is the domestic production of wool.

"There is still one other consideration which must not be overlooked. A nation can import only what it has means to pay for. Any check of domestic production diminishes the power of importation. The wisest of all our political economists, Stephen Colwell, has shown that a nation consumes abundantly only when it produces abundantly. When Pennsylvania is able to produce in a year five hundred thousand tons of iron, through the activities and quickening influences of this industry, and the rapidity of the societary circulation of which the whole State partakes, she is able to consume all these five hundred thousand tons. She pays for them through her own domestic production and exchanges stimulated by this great vivifying industry. Let the production of iron fall off, Pennsylvania will not import the deficiency. She will cease to consume. Railroads will cease extension, old tracks will not be repaired, the machine-shops will be stopped; with the arrest of production, the power of consumption comes to an end. This is as true in wool-industry as in iron production.

"Unfortunately our wool-growers did not do justice to themselves by the exhibits of raw fleeces at the International Exposition; but the foreign exports in the wool industry at Philadelphia saw with unconcealed surprise the evidences of our domestic wealth as displayed in our fabrics. They saw, with astonishment, blankets made from American wool in the new States of California and Minnesota, as well as old Massachusetts, which seemed fit only for royal couches; flannels, on the one hand, of snowy whiteness and of the softness of cashmeres, and others dyed with every hue of the rainbow, and in all varieties, so cheap and abundant as absolutely to shut out all foreign competition; shawls, pleasing in design and substantial in texture, and yet so reasonable in price that the humblest work-woman could afford the comely covering; yarns of every shade which the infinite applications of the knitter's art could demand, recalling Morris' lines—

'The many colored bundles newly dyed
Blood red, and heavenly blue, and grassy green;
Yea, and more colors than man yet has seen
In flowery meadows midmost of the May;'

fancy cassimeres rivaling the best products of Elbeuf looms; and worsted coatings which had their only rivals in the master-pieces of Sedan. They heard manufacturers declare that for all these fabrics they preferred American wool, because it is 'stronger, softer, and works more kindly.' We believe, in fine, that the conviction forced reluctantly upon our foreign visitors as to the power of America to supply its own markets, was due no less to the evidences of our command of raw material than to the proofs of our ingenuity and skill in fabrication.

"Before dismissing this branch of our subject, we ought to answer the question which will naturally occur to many—what reason is there for the alleged superiority of American wools? The answer is not difficult. All experts in wool fibre recognize that there are well-marked characteristic qualities in the wools of different nations, even when produced from the same races. The American wools to which we have referred are those of the Merino race, which are our principal product. Their superiority is due, in the first place, to a physical cause—our characteristically dry climate. Prof. Sanson, an eminent French authority, has shown that a dry climate is indispensable for the health or successful culture of Merino sheep, and that even the will of Napoleon failed to make the Merino sheep successful in the moist or oceanic climates. The second and most important cause is a moral one. In all other parts of the world, the flocks of Merino sheep are tended by hireling shepherds. In this country, as a rule, the farmer is his own shepherd, and the flocks are usually so small that they can receive the closest supervision. Not without an eye to thrift, but in part influenced by a morality which is of Puritan heritage, the American farmer would sooner starve himself than his animals. Regular and abundant feeding makes healthy sheep, and strong and uniform fibre; that is, without the weak spots caused by an occasional deficiency of food. Thus the high quality of American wools is due mainly to the moral habits of our farming population.

"*Part of the Wool Manufacture.*—We have thus far considered only the relations of the agricultural branch of the wool industry to our national economy. We have yet to consider the wool industry as a branch of the mechanical, chemical, and industrial arts, or, in other words, the relations of the *manufacture* of wool to the State. The common sentiment of the civilized nations of the present day that, next to the preservation of liberty and justice, the highest duty and crowning glory of a nation is the acquisition of the industrial arts, is pronounced by the international expositions of the last half century. It will be affirmed with enthusiasm by the eight million visitors to the Centennial, who have returned delighted, instructed, and inspired, as it were, with a new sense, an ambition for the precedence of our nation in the industrial arts. Among these arts, those of the textile industry take the first rank. They contribute most to the comfort of the people, and to one of the strongest passions of man—the love of personal adornment; for, if there is one thought which predominates in a city population, it is that of the selection and preparation of clothing. In the great cities, it is the trade in textiles which throngs the thoroughfares, makes the streets gay with colored tissues, builds palatial warehouses, creates the highest rents, and secures the largest fortunes to the great distributors. The textile industry, above all others, displays the command of man over the forces of nature. Mr. Garsed, of Philadelphia, who manufactures in every day of ten hours thirty-three thousand *miles* of cotton thread, with the expenditure of force derived from seven tons of coal has shown by careful calculation that, if it were possible for such quality of thread to be made by hand, it would require the labor of *seventy thousand* women to accomplish this work in the same time. The command of the improved textile manufacture increases the power of the factory operative over the hand workman more than a thousand-fold. And this is the chief source of the supremacy of the manufacturing nations. The profit on the manufacture of cotton in Great Britain, during the last fifty years, has exceeded five thousand million dollars. Says Mr. Porter: 'It is to the spinning-jenny and the steam engine that we must look as having been the true moving powers of our fleets and armies, and the chief support also of a long-continued agricultural prosperity.'

"To come nearer home, the textile industry is the chief means of diversifying the occupations in the older States, of removing surplus population from worn-out lands, and of equalizing, by the aid of machinery, the weak muscles of more than half of our working population —the women—with those of men. It is shown by the first volume of the census returns of the State of Massachusetts, just published, that this State, having the most dense population of any State in the Union, and ranking seventh in actual numbers, in 1875 employed in the textile manufactures 85,287 persons, and, if we add those engaged in the allied clothing manufacture, 28,935—a total of 114,222; while the numbers employed in agriculture, the care of animals, and the fisheries, is but 81,156. The whole number employed in all manufactures and other mechanical industries was 316,450. The product of manufactures and fisheries in 1875 was $596,415,866, while those of agriculture and mining were but $43,461,599. The prosperity of the city of Boston is due to the fact that it is the center of distribution of the raw material and finished products of those manufactures. One of her own satirists first ironically called this city the *Hub*—a phrase sometimes amusingly applied by strangers as an expression of her own conceit. But Boston, almost without metaphor, might be called the hub—of a vast factory wheel.

"But our theme is the relations of but one branch of the textile industry; and the general facts first referred to have been introduced only to give force to the first proposition which we make in respect to wool manufacture.

"*Pioneer of Other Industries.*—The manufacture of wool is the precursor of a general manufacture. The household fabrication of wool having been in former times, in temperate climates, the most extensively pursued of the household arts, the first advances from the rudest instruments to the more complicated machines were made in this industry—such as the change from the distaff to the spinning-wheel; from the card to the heated iron comb of Bishop Blaise; from the fulling-tub to the fulling-machine moved by water—the first substitution of the mechanical forces of nature for human muscles in the textile industry. In England, a protection of four centuries to the woolen industry had made her a nation of spinners and weavers, of artisans subsidiary to them. Commerce and capital had become familiar with the profits of a manufacturing industry; and the cotton industries were the natural offshoots of the wool manufacture, and needed hardly more than a hundred years to reach its present vast proportions. The Edict of Nantes, at the close of the sixteenth century, which restored to France the Protestants, who had acquired in the Low Countries the arts of spinning, weaving, and dyeing woolens, first planted the wool manufacture in France, out of which her varied textile industry has grown.

"In this country, the woolen mill is shown to be everywhere the pioneer of a diversified manufacture. As we have said elsewhere: 'Settlements are made in the beginning upon our water-courses. Water-power is first applied to the saw-mill; then comes the grist-mill; then follows the woolen mill. In old times it was the fulling-mill with its carding-machine. The fulling-mill was, and the woolen-mill now is, to a matured industry, what the emigrant's wagon is to the great interior—the pioneer of manufacturing enterprise, as that is of permanent settlement. The cotton, the machinery, the iron, the silk, the paper manufactures follow, and build up our Lowells, Patersons, and Manchesters. This is no fancy sketch. We remember the time when the Salmon Falls river, between Maine and New Hampshire, watering a district which was occupied by one of the earliest and most important settlements, dating back to 1632, had no other manufacturing establishment than a saw-mill, a grist-mill, and a fulling-mill. The latter disappeared, and was succeeded, in 1828, by a well-appointed woolen factory. Afterwards came other woolen factories and cotton-mills; and the Salmon Falls river moves now one hundred and thirty-two thousand cotton spindles and fourteen sets of woolen machinery.' This is but a type of the march of manufactures everywhere in the country. They propagate themselves by contagion; or, like the banyan tree, their branches descend and become trees. The communities where they are planted become imbued with industrial instinct and knowledge. Hence, practical men say that the best place to plant a new mill is by the very side of those which have been long established. Manufactures not only propagate themselves, but engender other industries, as cultivation, with new plants and flowers, attracts and multiplies the birds and insects. The erection of a woolen mill of two or three sets, in a new State, which seems to us a trifling affair, is an epoch, the dawn of manufactures, which all experience tells us will expand into a widely diversified industry, and its attendant results of wealth and culture.

"*Demands High Intelligence.*—One reason for the influence of the woolen manufactures is the high character of intelligence and skill required for its successful pursuit. In this respect it undoubtedly stands at the very head of the textile industries. Great, undoubtedly, as was the genius displayed by those who introduced the cotton manufacture in its present form into this country, there is much less required in continuing its fabrication. The whole product of a mill often consists of but a single fabric. As Mr. Bachelder, the most eminent cotton manufacturer living in this or any other country, says: 'Thousands of looms are employed making drillings, of precisely the same description, with the same number of threads both in the warp and filling, of the same average weight, with yarn of the same fineness, and without the least variation in any particular, as were first invented and made by me in 1827.'

"In the wool manufacture, especially since the general disuse of broadcloth, the requirements of fashion demand new fabrics or new designs every season. A large fancy cassimere mill will produce not less than two hundred distinct designs each season, making four hundred in the year. In some mills there are made not less than fifty distinct classes of fabrics, to say nothing of styles. New fabrics perpetually call for new machines. The producer in this industry can have no rest: he must be constantly learning. No degree of skill in the selection of other fabrics is comparable with that which must be exercised in buying and applying wool. Its preparation is more difficult, and the finish of its products is more complicated. Add to this that the dying of the wool fabrics requires what is a distinct art by itself in Europe, and in some branches, such as the indigo fermented vat, is the most difficult work in practical chemistry, and we see a sufficient reason why the wool manufacture takes the first place in the textile arts. Some branches of the wool manufacture, like that of carpets, require the most profound knowledge of the principles of decorative art; others, like that of printing stuffs, are based upon a knowledge of the chemical arts.

Indeed, it may be said that no industrial work brings so fully into play the results of scientific research and the practical applications of art, as the vast establishments in this country which make and print the mixed dress goods of cotton and wool. Thus it will be seen that the acquisition of a perfect wool industry is in itself the possession of the most important arts.

"*The Manufacture Essential to a Successful Sheep Husbandry.*—We have shown that without domestic wool we should not have mills. On the other hand, without mills we should not have sheep. We have exported so little wool that it has been said that the value of imported playing-cards exceeds the value of all the wool sent abroad from this country. Under the prevailing system of growing sheep in small flocks, it would be clearly impossible for the American farmer to compete in the markets of the world with the possessor of a hundred thousand sheep. We shall never export wool until a system of pastoral sheep husbandry, without artificial feeding in winter, is developed on a scale as broad as in Australia or Buenos Ayres; and the only means to that end is a market for our wools at home. For many years to come, the sole dependence of the American wool-grower must be the consumption of our home mills. Even with an equality of natural facilities, the prices of labor, the high interest on capital, local taxation, and the general expenses growing out of the higher demands of American civilization, will not permit our wool-growers to compete with the producers of wool in the southern hemisphere. No one can doubt for a moment that our mills sustain sheep-growing in this country for *wool* alone. But it may be said that mutton sheep would be grown for their flesh and lambs; while the wool might be exported, as in Canada, which has no home market for its combing-wools. In reply to this, we note the fact that, because she must export her combing-wools, Canada is rapidly diminishing the production of her mutton sheep, filling their place with Merino sheep, to supply her newly-established cloth-mills; while contiguous American States—Michigan, Ohio, and New York—are even more rapidly increasing their combing-wools and mutton sheep, for which they have a home market in the worsted mills, and the populations which the mills gather around them. Thus, recurring to the earlier propositions advanced in this paper, our woolen manufacture directly benefits the nation in supplying animal food, improving general husbandry, and settling new territory.

"*Clothes our People.*—Our own woolen manufacture cheaply and abundantly clothes our people. Our last proposition has established that our wool manufacture contributes materially to the first necessities of a people, by supplying animal food and increasing the productiveness of lands, thus cheapening bread. The benefits it confers in supplying the second necessity, clothing, are beyond calculation. Much as cotton and linen contribute to cleanliness and comfort, and silk to adornment, wool, in our rigorous climate, is the only absolute necessity. It formed the sole clothing of our million soldiers in the great war. Falstaff said: 'There's but a shirt and a half in all my company.' With respect to linen and cotton, the same might have been said of all our armies. So easily did our mills supply one of the first necessities of armies in the field, that, at the close of the war, there was an overplus of three million overcoats.

"*Sanitary Influence.*—Before proceeding to demonstrate the proposition in hand, we will pause a moment to consider the sanitary influence of abundant woolen clothing. Recent life statistics have shown that the average period of life in civilized nations has been lengthened several years during this century. The more extended use of woolen clothing has materially contributed to this result. The soldiers of our Revolutionary War were largely clothed in linen. For general female use there was nothing better than the linsey-wolsey, with linen warp and woolen woof. This was not abundant, on account of the scarcity of the wool. As wool became more abundant, the cloth was made in families; the best homespun was scarcely thicker or warmer than a common flannel of our times. Half a century ago, even the cloths worn by the wealthy were light and thin compared with those now in use. The use of woolen underclothing, such as flannel or knit shirts and drawers, was almost exclusively confined to men of the easy classes. Women in moderate circumstances wore only cotton dresses; for the invaluable mixtures of wool and cotton, the mousselines-de-laine and alpacas, were unknown. Women and children of wealth were clad more thinly than the poorest of our day; and consumption stalked with its deadly scythe over all our northern land. To-day, in our New England districts at least, the wool-knit undergarments are worn by all classes of every age and sex. Every working woman has her mixed woolen dress, and her warm woolen shawl; every workman his knit cardigan. No laboring man is so poor as not to have an overcoat. We remember the time when not one man in ten in the country districts had such a garment.

The cloths for common wear are of double the thickness and warmth that they were even thirty years ago. Some of them, such as the Esquimos and beavers, are impenetrable to the cold. For out-door winter wear, the material for clothing of men and women is almost identical. Women discard 'ladies' cloth,' and don cloaks of beaver or kersey, and dresses of fancy cassimeres; while the universal water-proof makes rain and snow innocuous. Physicians concur in declaring that, as a result of this improved clothing, colds and pneumonia are less prevalent, and the ravages of consumption have been largely checked. The *sanitary* influence of the woolen industry is, therefore, no mean part among those which it plays in the national economy.

" *Capacity and Product of American Mills.*—The question next arises, can our own industry perform the great work of clothing our people *cheaply*, *abundantly*, and *well* without help from abroad? In answering this question, we must repeat facts elsewhere stated in other connections, and familiar to many of our readers.

" First, as to our machine capacity. It will serve the purpose of our argument equally to take the census statistics of 1870, while they have official authority.

"The number of sets in the manufacture of woolens proper, consisting of cloths, flannels, and blankets, and yarns, is placed at 8,336. In the worsted manufacture, the number of combers is set down at 193, and the number of sets at 98.

"One comber being the equivalent of three sets, the total in sets is 677.

"In the carpet manufacture, the number of sets is 241, with 100 combers, making a total in sets of 541.

"In the hosiery manufacture, including cotton, but principally wool, 519 sets.

RECAPITULATION.

Woolens	8,336
Worsted	677
Carpets	541
Hosiery	519
Total sets	10,073

"The value of the products of this machinery, as given by the census, was as follows.

Woolens	$155,405,356
Worsteds	22,000,331
Carpets	21,761,573
Hosiery	18,411,564
Total	$217,578,824

"Our imports in that year were:

Woolens	$14,660,403
Worsted dress goods	15,447,960
Carpets	3,940,707
Total	$34,049,070

"Add to this, which is the foreign valuation, the custom duties, premium on gold, and profit of importer, making the home valuation double that of the foreign, the home value of these imports equaled $68,098,140. This, added to domestic production, made our whole consumption in 1870 $285,676,964. So that our domestic production constituted three fourths of our whole consumption. As to the character of the machinery and processes used in the above named 10,073 sets, which, in fact, represents the degree of skill attained, we repeat the statement made to us personally by one having the highest authority, viz: Prof. Herm Grothe, of Germany, the author of the latest and most esteemed European treatise on the manufacture of wool, who, the last summer, visited our principle representative establishments. He declared that our mills had all the recent machinery and processes found in the best mills abroad, and that he saw nothing to be improved either in the mechanical appliances or administration of our establishments.

"*Character of Our Products.*—Having had the opportunity of an official study at the International Exhibition for many weeks, in company with able foreign and American experts, of our own wool products in comparison with those of other countries, we feel authorized to express an opinion as to the character of our products with confidence. In woolens proper, we make, with no exception now occurring to us, all the classes of fabrics made in the best European mills. The same may be said of hosiery. In worsteds, we make all mixed cotton and wool dress goods—the classes of dress fabrics entering into most general consumption, and therefore of the first utility—and many all-wool worsteds. We do not make the all-wool merinos and cashmeres, which are not made successfully even in England, nor some other fine wool novelties in dress goods, which are obtained wholly in France. Their use is confined to the wealthy and fashionable classes. Some we have very recently attempted with signal success—such as the all-wool merino plaids and matelasses—and shall doubtless make them all, except possibly the merinos and cashmeres. In carpets we produce every variety, except the Persian and Turkish and the Aubusson hand-made carpets, used only by the opulent classes.

"In woolens, we are inferior only in broadcloths, and that not in quality but in quantity of production, the general disuse of broadcloth, except for dress suits and by the wealthy, making it more profitable for our mills to run on goods in general demand. That we have no want of capacity is shown by the product of the few mills who still pursue this branch of manufacture, and by the fact that the finest sample of broadcloth shown at the Exposition, though not for competition, was made in this country twenty-three years ago. In blankets and flannels, our products are absolutely unequaled by any made abroad. In fancy cassimeres and worsted coatings—the great articles of consumption all over the world—we equal any, surpass most, made abroad, in texture, finish, and beauty of design; foreign manufacturers eagerly seeking samples for imitation in their mills. Our thicker cloths for overcoatings suffer nothing in comparison with those made abroad.

"In dress goods, there was little opportunity to make comparison, as Bradford, the principal competitor in classes of goods made by us, did not think it wise to enter the field. But the command of our own market against foreign competition settles the question as to the quality of our goods. In carpets of the cheaper and medium qualities, up to two and three-ply ingrains, we are without competition, making the cheaper kinds so abundantly and cheap, that no home, however humble, need be without this most characteristic of household comforts. The extent of their use in our homes was a subject of surprise to our foreign visitors. The higher classes of tapestries and Brussels, and still higher, of Wilton and Axminster, in taste of design and perfection of texture, were absolutely equal to the best foreign samples; and, judging from the length and closeness of the pile, surpass them in wearing qualities. In this department, we have nothing to learn abroad.

"The question of comparative cheapness of goods is more difficult to fix exactly. Foreigners declared that our fancy cassimeres were equal to those of Elbeuf, and cheaper than similar goods could be obtained in the French market. On the other hand, the cloths of Belgium and Yorkshire were unquestionably apparently cheaper than our own; but this apparent cheapness is illusory in a great degree, when we consider the low character of the materials which enter into their fabrication—in one case, weak Mestiza wools; in the other, shoddy—when compared with the substantial materials of the American cloths. We do not hesitate to assert that there are no medium woolen goods, such as constitute the great bulk of consumption, which, in wearing qualities, will compare with American fabrics. The English admit that they consume not less than *thirty-eight thousand tons* of shoddy annually in making their woolen goods. The Belgians boast that they use the cheap Mestiza wool, and laugh at the Americans because they 'stick to the old-fashioned, strong-bodied, long-stapled wools,' which are so valuable that they ought to be used for combing purposes, and because we do not 'turn to advantage all wastes and refuses, which now, skillfully mixed, play such an important part in lowering the cost of fabrics.'

"The point which we make is, not that the English and Belgians do not obtain their cloths more cheaply than we do, but that it is more *economical* for us to consume our own products than to depend upon the English and Belgians. The question of economy involves the wearing qualities of our cloths, the facilities for paying for them by domestic exchange—as with wool by the farmer, with labor by the mill operative, with market produce by the gardener, or other facilities which attend home consumption. One of these facilities deserves attention, as it is the very climax of our wool industry. We refer to our ready-made clothing manufacture. Nowhere has this manufacture attained such perfection and economies as in this country. It is founded upon our wool manufacture; for seven eighths of its raw material is furnished by our mills. So important is this industry, that it employs directly, in Massachusetts alone, 28,935 persons. Upon so vast a scale is it conducted that one establishment in Philadelphia, John Wannamaker's, covers two and a half acres, and one floor contains two million dollars' worth of goods. This manufacture clothes all the boys, and the great bulk of our male population. It is declared by experts in this industry that 'the wholesale manufacture has reduced the cost of clothing to the masses *one half* certainly, and, making allowance for the difference in the value of money, even more.' That system of production and consumption proves itself to be most economical to the people which makes consumption the most *abundant*. That our people are the most abundantly and substantially clothed of any in the world needs no demonstration. It is shown in our army, and the vast superiority of its cloths over those furnished to any foreign troops. It is shown in what foreigners at Philadelphia so much admired—the beauty of the uniforms of our volunteer troops. It was shown in the costumes of the millions at the Exposition; and, especially, in the absence of all distinction of garb in the people of the seaboard cities, and the remotest interior. The personal appearance of a population indicates its social condition; and thus the woolen industry performs its last part in the national economy by abolishing the outward distinctions of class, and cultivating the personal self respect of the individual citizen.

"A question of public economy like that which we have discussed addresses itself directly and imperatively to those who control and influence national legislation. We have failed in our purpose, if they do not apply the lesson which these facts teach."

PROTECTION AND CULTIVATION OF TIMBER.*

The scarcity of timber in the country is one cause, and a very material cause, of the drying up of the streams and scarcity in water; also one cause of drought in so many localities. If the forest timber was allowed to remain more uniform, or, if cut down, others were planted in their stead, the water would be more abundant, crops would be more certain, and grass more plentiful. It is a well-known fact, the cutting away timber withdraws much of the moisture from the earth, which is kept there by the shade of the trees and their roots. Cut away all the growth alongside the branches tracing a farm, and in a few years the streams become dry, and the farmer must resort to ponds, or drive his stock to the timbered regions to find water. A large section of country, deprived of its forest, endangers other sections, perhaps larger in territory and well wooded, of the strong streams, and subjects them to the want of good drinking and stock water. The fountains in these woodless regions are dried up, and hence the strength of the streams is lessened as they lengthen out. On the water-courses, and at their heads, there should always be a good supply of timber. Forest trees are necessary also for shade in summer and shelter in winter. All animals fatten better, and retain their flesh more readily, by having a sufficient quantity of shade in the pasture or feeding field. In the winter, the woodland is a great protection by breaking the winds, and preventing great suffering on the part of the animal.

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* NOTE.—I am indebted to the able pen of Gen. Green Clay Smith, of Frankfort, for this valuable article.

Another great necessity for cultivating and protecting our forest: we should not live for ourselves alone—other generations are to come after us—and in greater numbers, with more demands than at present. Let us leave the country better than we found it—rich to produce, beautiful to behold, and in every way enjoyable, causing our posterity to praise our intelligence and providence, and grateful for such an inheritance. With such a course, and a proper education of each generation, ages will pass by finding the wealthiest and most magnificent country on earth.

One of the most important and interesting subjects to be considered by the agriculturist of Kentucky is the preservation and cultivation of the forest timbers of the State. Wood is an invaluable element in every department of life and prosperity. Recklessness in its use must be abandoned, and its wanton destruction is almost criminal. Railroad and water communications are becoming universal, and in a short time will so intersect the whole State that timber in any part of it will be not only valuable, but in absolute demand, not only within the State, but throughout the Union, and many parts of the world. There are not many States superior to Kentucky in the character and value of her lumber, and with some of it, is superior to any other. The walnut, sugar-tree, ash, oak, poplar, and hickory are of the finest quality, and is being sought for from all parts of the world. Millions of dollars in timber have been burnt up in the way of great heaps, in order to procure lands for cultivation, which have been worn out and now lie idle. Millions more are now being carelessly thrown away, because the people do not know the value of a tree.

With many of our farmers the rule should be, when one tree is cut down for use, two should be planted out. There is always a poor spot where a walnut or hickory or ash or cedar might be planted, which would, in a few years, make in part good fuel, while the body would make good lumber of great value. The walnut is of rapid growth, and a good fertilizer. Plant walnuts broadcast in an old worn-out field; let, if you please, the briers and brambles and weeds grow up with them for a few years, and then, as you clear away the briers, &c., sow your grass seed; and in a short time the grass will take firm root, and the walnut leaves and fruit will make splendid manure, strengthen your grass, and within ten or fifteen years you have a splendid grass field, covered with magnificent forest timber, from which you may cut a few from year to year of great value for lumber, and the knots for veneering purposes, worth more than your land would really rent for to be cultivated, while yet you would have the profit of your grass. Other fields might be sown thick in hickorynuts, which would soon spring up, and in a few years yield an annual profit in hoop-poles. For this planting such fields should be used as would not inconvenience the farmer, and which, fenced to itself, could be kept alone for this purpose. Amongst all the forest trees, perhaps the most profitable to be planted, and at the same time pretty and ornamental, is the walnut. It is good for fuel, fencing, and carpentering, and at the same time the most deadly enemy to undergrowth and filth that can be planted on a farm; yet a variety of trees can be planted every year, with but little cost and labor, and thereby always making a farm valuable and salable; whereas, if barren of forest timber, finds no purchaser.

If this rule is not adopted, soon the counties of Montgomery, Fayette, Clark, Bourbon, Scott, Madison, Woodford, Jessamine, Boyle, Garrard, Lincoln, Shelby, Franklin, Henry, and others, lying in the central part of the State, will be without timber sufficient to meet their demands. In fact, in a large number of counties throughout the State, there is such a wanton destruction of timber that, if it is continued for twenty-five or fifty years longer, the State will be compelled to look to other places for her lumber in a large degree. The mountains are rapidly losing their immense quantity of timber, and no planting is going on anywhere. This course will soon ruin the timber interest of the State, and thereby take away one of her greatest industries and means of wealth.

It would be advisable, and it is earnestly recommended, that stone fences be built wherever practicable, in order to save the timber. Let the farmer remember that when he cuts down an ash or walnut or oak tree to make one hundred or one hundred and fifty rails for his fence, he has spoiled a valuable tree, fitted for building and furniture purposes, and lessens the price of his farm to that extent. The knots in one tree which he leaves to burn in the fall or to rot, are worth almost as much as his rails to the furniture-maker, and they, with the trunk of the tree, will always command a good price. Hickory wagon and carriage timbers are becoming scarce, and hence the high price of all such vehicles; so also is it true of implements where hickory timber is used.

TO MAKE BONES USEFUL.

I have frequently received letters asking how to make bones useful. For the benefit of those farmers who are considerate enough to collect bones for fertilizing purposes, I will here give a short article published by Prof. A. R. Ledoux, the State Agricultural Chemist of North Carolina. "Oil of vitriol," or sulphuric acid, is composed of one part sulphur and three parts oxygen, and is exceedingly corrosive in its action. It is known by several names to the people, most usually, however, as "oil of vitriol" or "aqua fortis." Its price is, by the carboy of from 100 to 150 pounds, generally three cents per pound in Louisville or Cincinnati. Prof. L. says:

"The chief value of bones as a source of plant-food consists in the phosphoric acid and nitrogen which they contain. The former is combined with lime as phosphate of lime, and in new bones this phosphate of lime should constitute fifty or sixty per cent. of the whole, the remaining forty to fifty per cent. being made up of cartilage, gelatine, magnesia, &c., &c. The nitrogen is in the organic matter (cartilage and gelatine). The phosphoric acid, in combination with the lime, is held in a comparatively insoluble state by the organic matter with which the bone is surrounded and permeated. When acted upon by the soil, the fibre and other organic matter are decomposed, their nitrogen being converted into ammonia, while the phosphoric acid is gradually rendered soluble and capable of being assimilated by the growing crop. In view of these facts, two points are to be taken into consideration by the farmer. First, the comminution by which the action of the soil is aided and accelerated; and, secondly, the means of artificially rendering the phosphoric acid soluble.

"If no mill is convenient, it will pay the planter to set a hand at breaking up the bones into as small pieces as possible, which may be done by a heavy hammer, and a little patience. When cottonseed or other nitrogenous organic compound is obtainable, it will pay to burn the bones, if it is found too difficult to break them, and then there will be but little difficulty in getting them into good subdivision.

"Bones are rendered soluble with great ease by treating them with oil of vitriol; and where this acid may be obtained cheaply, it will pay in almost every case to employ it. The following directions can be easily followed, but those not familiar with the handling of so powerful an acid as oil of vitriol should use the greatest care. The bones should first be broken up into the size of walnuts, and weighed out into lots of about 100 pounds each. A large tub can be used for the operation, which is conveniently made by sawing a petroleum barrel in half; and now we are ready to begin the work. Let the manipulator put on old clothes, which will be no great loss should the corrosive acid spatter upon them. Have at hand a solution of washing soda or weak lye to put upon the hands or face, as an antidote, should a drop of acid touch them. Place a layer of bones eight or ten inches deep in the bottom of the tub. Pour the oil of vitriol from the carboy slowly and steadily into a pitcher, or other article of stoneware (which was previously weighed) until full. Wet the layer of bones in the tub thoroughly with water, then pour acid cautiously upon them from the pitcher to the amount of about fifty or fifty-five pounds of acid to 100 pounds of bones, stirring and mixing the whole mass with a wooden shovel or an old hoe. Then put in another layer of bones on top of the first, and repeat the process until the tub is full. After standing from three to twelve hours, shovel the whole out into a heap, and mix with it, if obtainable, some ground plaster. This will help to dry the mass thoroughly, and render it more readily broken up when it is to be applied.

"I have given these outlines somewhat hurriedly, owing to pressure of work, but I think they will be found sufficiently plain. Let me once more caution those who use sulphuric acid (oil of vitriol) against its dangerous corrosive properties. When used with care it is perfectly manageable, but a dangerous substance to handle carelessly. *Never pour water into acid.* When desiring to mix them, pour the acid into the water, stirring all the time. I have often recommended mixing the water and acid separately, and pouring the mixture upon the bones. When this is done, pour into a tub about three times as much water as you propose to take of acid (about 150 pounds water to 100 pounds bone), then pour from the pitcher (slowly and steadily) the acid into the water, stopping every little while and stirring the mixture. It need not surprise you if the water grows very hot, and the acid falls into it with a gurgling sound. Should any spatter upon the person wipe it off at once, and apply the soda or lye.

"Rendering bones soluble in this way greatly increases their value, and with a little trouble the farmer can make at home as good or better fertilizers than he buys for twice the cost of his labor and acid.

"Whether broken up or unbroken, rendered soluble or not, bones should be always applied underneath the surface of the ground. I recently saw a large vineyard, every vine having a pile of bones about it. The owner was wise to save the bones, but had he broken them up, or at least buried them a few inches, they would have repaid his labor in time and effect a hundred-fold."

CORN VS. HOGS—CORN IN PORK.

Many experiments have been made of late years, with great care and accuracy, to determine how corn can be turned into pork with the least cost and at the most profit; in other words, how much pork can be made from one hundred pounds of corn in the grain. Prof. Miles, of the Michigan University, experimented with three pigs. One pig ate forty-eight and one half pounds of corn in the month, and lost one pound in live weight; another ate fifty-one and one half pounds in the same time, and gained four pounds of live weight; a third ate one hundred pounds, and gained nineteen and one half pounds of live weight. All three were fed as much as they would eat. Their appetites and food-consuming capacity differed, and the result shows accordingly. This, and many similar experiments, show that, with ordinary hogs, it takes something over one and one half pounds of corn per day "to run the machine," and the fattening comes from the food consumed over and above this amount. This should teach the farmer to keep such breeds of hogs as require the least amount of strong food to supply the demands of nature, in wear and tear of the physical system, or, in other words, such as can have their machinery of digestion run with the least food. Some breeds of hogs require nearly double "to run the machine" that others do. The latter, of course, are the most profitable.

Again, experiments carefully made by Messrs. Lawes and Gilbert, of England, prove that, with well-bred hogs, one hundred pounds of corn, added to the amount necessary to run the vital forces of the hog, carefully fed, will produce from fifty to fifty-four pounds of increase or gross weight. The amount fed and consumed to keep the hog in good living order varies greatly in pigs, according to breeds, method of raising, &c., &c. The general rule being, that, to average hogs, fifty-seven pounds out of every hundred pounds of corn go to support the vital functions, while forty three pounds go to produce the increase, which will be about twenty-three pounds. Indian corn is one of the very richest of feeds; it contains about sixty-eight per cent of starch, and seven per cent. of oil. Experience has proven that, in the Mississippi Valley at least, nothing can be fed more cheaply to hogs than corn. It contains all that is requisite to sustain the vital functions, as well as what is needed to give large quantities of surplus fat or lard. The question with the farmer is, after giving the pig enough corn to run his "animal machinery," how much pork can be got out of the balance consumed by the animal; that is, to what extent can man use the *animal pig* as a *chemical laboratory* in which he can change his surplus corn into salable pork? As before stated, one hundred pounds of corn, fed to an average hog, will usually produce (if the hog is in ordinary order) twenty-three pounds of additional live weight or gross weight; but if, in the same time that the hog consumes the one hundred pounds of corn, we can make him consume one hundred and fifty pounds, then his increase would be twice as much, or forty-six pounds. This is on the supposition that it takes no more to sustain the vital forces of the hog eating one hundred and fifty pounds than when he eats the one hundred pounds.

Experience has proven that usually this is the case; consequently, we find that where hogs are first put up to fatten in stalls, they only eat what is needed for their physical support, but as their appetites become stimulated by rich food, and want of exercise prevents so great wear and tear of the vital forces, they soon begin to eat more, and fatten faster; so that a hog gains more pounds from the sixth to the ninth week in the stall than he does the first five weeks after he is confined.

In fattening pigs, then, our first object should be to reduce the demand on the stomach for food to sustain the vital powers of the animal. To do this to the best advantage, the pig should be kept in clean, warm, dry quarters or stalls, so as not to have to use his carbon or fat to keep warm. Besides, close quarters will prevent restlessness or too much locomotion, and consequent expenditure of forces, which, if unexpended, would otherwise remain in the body in the form of carbon or fat. The more the pig eats, and can thoroughly digest and assimilate, the faster he will fatten, and the cheaper will he turn corn into pork and lard.

The general experience, is that it takes from 1½ to 1¾ pounds of corn per day to supply the needs of the animal to hold him in a uniform thriving condition; and whatever the pig can be made to consume over this amount is converted into gross increase, in proportion as 50 is to 23; that is, twenty-three fiftieths of all the corn a hog eats when in good health, good appetite, and in a fattening condition, is converted into additions of gross pounds of weight to the hog. Suppose, then, a hog eats 6¾ pounds of corn or corn meal per day; take off 1¾ for support, there remains twenty-three fiftieths of the balance, or 2.30 pounds of increase of gross pork. Taking this calculation as a basis, if the pork is worth four cents per pound, the 2.30 pounds amounts to 9⅕ cents, which would make the 6¾ pounds of corn equal in cash to 1.25 cents per pound, or 72¼ cents per bushel of 56 pounds.

We see, then, that with an average good lot of hogs corn, at 72¼ cents per bushel, will do to feed to hogs when they are worth 4 cents gross, provided we are willing to do all the work and bear all expenses for nothing. So if pork is worth 3 cents gross, the 2.30 pounds (as above) will be worth 6.9 cents, which would make the 6¾ pounds of corn equal in cash to 1.02 cents per pound, or 57 cents per bushel. Now, if we allow for a small profit on our corn for wastage, trouble of feeding, &c., we will find that, when a farmer can sell his corn at 50 cents per bushel, he only gets 7 cents margin per bushel if he feeds this corn to hogs worth at his pen 3 cents gross; and if he can sell corn at 45 cents per bushel, he only gets 12 cents margin per bushel for all risk of waste, insurance, &c., if he feed this corn to hogs worth 3 cents gross at the pen. If corn is worth 30 cents, then the farmer can afford to feed it to hogs worth 3 cents gross, and will have 27 cents per bushel to cover all losses, insurance, dockage, &c., and freight and other expenses, if he ships the hogs to market.

It would be well for farmers, when they fatten hogs for market, to experiment and compare their figures with those here given. It is a safe calculation for a farmer to make, when corn is worth $1 50 per barrel, to feed it to good hogs, provided he can sell them at $3 per hundred pounds gross, or for a corresponding price net, counting on average hogs 33⅓ per cent. for the gross of the first hundred weight of a hog, 16⅔ for the second hundred, and 8⅓ for the third hundred. At these figures he will come through the experiment with only a moderate profit.

FOOD FOR DOMESTIC ANIMALS.

[Translated by John H. Klippart.]*

COMPARISON OF THE DIFFERENT THEORIES IN REGARD TO THE VALUE OF FOOD FOR DOMESTIC ANIMALS.

By Prof. Dr. Julius Kuehn, Director of the Agricultural Department in the University of Halle.

"That was indeed a golden age in which the scientific husbandman of the old school used to make his calculations of the value of hay based upon tabulated statistics. There were about as many different scales upon which the value of hay was determined as there were prominent writers on the subject of agriculture. In fact, the value of hay depended on either the teachings of a Thaer, or a Koppe, or a Schwartz, or a Zabet, or of thirty others who had written on the subject, reducing the whole to uncommon simplicity as a matter of course! For instance, it has been well determined that the ruminants required 1.60 (according to others, of course, 1.50) of their actual weight in hay value to support life, and that all beyond that might be regarded as productive food. According to the calculations of one, one pound of hay value will produce 1 pound of milk and 1-10 of a pound of the fœtus forming in the cow, or in case of young cattle, or such as are intended for slaughter, it adds 1-10 of a pound of flesh. Another got nearer still by fixing upon one pound of hay value to 2-25 of a pound of flesh and 4-5 of a pound of milk. These are positive figures, of course! Even in our day they are regarded by many as the true basis upon which food should be estimated; and yet this whole theory of hay value is nothing but folly and an idle delusion.

"It is quite impossible, too, that one should be able to determine the exact nutritive values in the different kinds of food, when hay is taken as the standard of comparison, as assumed in the theories just mentioned; because 100 pounds of food might produce different nutritive results, depending upon the kind of soil upon which it had been produced, the manner in which it had been cured, and especially upon the manner mixed and presented as an article of food. Herein we find the reasons why different authors could not agree upon the hay values, often arrived at by the sheerest guesswork, and in part so often collected from insufficient and unreliable sources. Perhaps it may not be out of place to adduce several examples of estimates made upon the value of hay as an article of food. According to Meyer, 100 pounds of hay has the same value as 150 pounds of rye straw. According to Black, the value of rye straw is 200 when compared with hay; according to Swertz and Koppe, 267; according to Veit, 300; to Pabst, 350; to Petri, Hanmann, and Miras, 500; to Thaer and Schree, 660. Here, then, are differences varying from 150 to 660 pounds represented as of equal value to 100 pounds of hay! Meyer values wheat straw at 150; Schree, at 500; Hlubeck regards the most probable figure to be 467⅔! upon the standard of 100 pounds of hay. Brieger regards the red beet 220; Flotow, 500. Rye (in the grain) the latter estimates 25 pounds and Thaer 71 pounds as equal to 100 pounds of hay. Like differences are found in regard to other articles of food. Upon potatoes only do we find something like unanimity. Here 200 is the figure, yet differences of 100 per cent. are nothing very rare. Meyer and Brieger deem the hay value of the potato to be 150, Makensen makes it 300; and each may have been correct upon his own grounds of experiment. He who would mix his potatoes, rich in starch, with food wanting a sufficient amount of protein, would of course find their nutritive value much less than the other who would serve them with food rich in protein; for in the first case a good share of the nutrition contained in the starch would pass through the digestive organs of the animal unemployed and unassimilated; in the latter case, all the nutritive qualities were relatively exhausted by the digestive functions. Indeed, there is no simple expression for the nutritive worth of an article of food, this being so dependent upon the manner in which it is served up; and for this reason no definite rule of hay value could be obtained, and all theories have left us in despair of ever getting upon a fixed basis. Boussingault endeavored to find a unit of measure in the amount of nitrogen which a food contained, in order to compare it with the nutritive value of hay; but here those articles of food, like potatoes and sugar-beets, deficient in nitrogenous properties, but containing a rich supply of very digestible non-nitrogenous ingredients, are not sufficiently estimated.

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*Note.—From Ohio State Agricultural Reports.

"It was, therefore, a progressive step on the part of Emil Wolf to take the non-nitrogenous constituents of food into consideration, and to put a stress upon the proper relation in quantity of the nitrogenous to the non-nitrogenous ingredients in articles of food. The data he obtained on this basis upon nutritive values, as generally acknowledged, as they soon were, could not be sustained for any great length of time; they all tended to reach that unattainable end of fixing upon nutritive values in figures, as had already been the case in hay values, and of course failed when put to a strict test. In reality, their notations were nothing but concessions to the prejudices of husbandmen. E. Wolf himself says:* 'The practical man demands a scientifically tested table of nutritive values, which can be substituted for these unreliable hay and rye value tables, and used in their stead. A nutritive value must be determined by some fixed number, in order that it may be sufficiently comprehensive as a whole, and a practical analysis made of the same.' Dr. Grouven † and Dr. Henneberg ‡ have satisfactorily shown that the nutritive values of E. Wolf were quite as unreliable as the ones before him, and their author has himself latterly dropped them.

"And still we have no reason to regret that E. Wolf did not limit himself exclusively to the chemical composition of this kind of food; for, without that concession, and without the partial retention of his hay-value theory, it would not have been as easy a matter to accustom the practical husbandman to regard the chemical combination or nutritive relations of the different kinds of food to one another. It is, then, to E. Wolf that the honor of having opened the way and disseminated a better understanding to progress must be ascribed. But for a farther development in the matter we are indebted to Dr. Grouven. He was not satisfied in presenting the untenableness of the hay-value theories, and to direct our attention to the fact that we can only attain a correct plan of feeding upon the chemical composition of the food used, and the daily wants of animals to be supplied from different chemical ingredients, as Haubner and Von Langenthal had done, but even went so far as to set up systematic statistics upon animal food, at the same time endeavoring to fix upon the amount of fibrine, protein, fat, and carbo hydrils the domestic animals should contain, their live weight taken into consideration, in order that their nourishment might lead to the most useful results. Now, the normals given in Grouven's statistics, even after being in part modified as they are in the second edition of his Chemico-Agricultural Lectures, can by no means be considered as conclusive.

"*It is the object of cattle-raisers to change off from fibrine to protein nutriments, and it is about as impracticable to fix upon nutritive values as it is to*

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* Natural Laws of Agriculture, part 2, page 453.

† Lectures on Agricultural Chemistry. Cologne, 1589

‡ Contributions toward Founding a Practical Feeding of the Ruminants. 1860.

establish hay values. But still it was of the greatest importance and a highly worthy undertaking, that Dr. Grouven had fixed upon *relative* figures in his nutritive values. By his tables the nutritive ingredients of all kinds of food could be compared with each other, and although the practical cattle-feeder may have discovered a defect about his hay values, he found a sudstitute for all this in the fixed figures of his tables. He must now learn to regard these figures not only as submitted calculations upon the subject, but apply himself to the testing of their results. New experiments made by Henneberg and Stohmann, of Weende, and the tests of Grouven, of Salzmünde, have verified how unfixed our basis of feeding still is, and that the cattle-raiser, in making his nutritive calculations, should be very careful to begin with a proper starting-point in making them. For we have already shown that food containing nitrogenous ingredients is never entirely digested, and that the nutritive value of an aliment will, to a great extent, depend upon the amount of nitrogenous ingredients contained therein which are only in part submitted to the processes of digestion. The result of all these investigations by E. Wolf and Grouven was, that the partial digestion of fibrine seemed to make up, or in a manner compensate, for the indigestible nitrogenic ingredients in certain aliments, leaving the matter, as far as the analysis of food is concerned, in a rather unsatisfactory condition for the time being. Wolf's hay values have been justly abandoned, and Dr. Grouven has himself renounced his nutritive values; and yet the subject is not as unfavorable for further investigation as it appears to be. Exact figures are, of course, entirely wanting, and will probably remain so in the future, but the continual investigations made in Weende and at Salzmünde, supported by improved respiratory apparatus, will eliminate many a supposed law in regard to the feeding of our domestic animals, and our husbandmen will be furnished with a fixed set of facts that will, at least, prompt them to independent investigations, and teach them to form more correct opinions of their own. But even now we are not without such bases by which we can measure the rational feeding of our domestic animals. We might speak of it here a little more extensively. Such a basis will forever be found *in the chemical composition of the food itself*. Our further investigations in this matter may yet widen our information, but even the investigations that have been made in regard to the composition of aliments as we have them now furnish us with very useful starting points; yet we must not apply those average tables on nutritive values in the way this is generally done; the composition of one and the same kind of aliment may be quite different, and for that reason the mean given in figures is not quite correct when actually submitted to an analysis. I will adduce, as an example, the chemical ingredients of meadow grass:

		Lowest per cent.		Highest per cent.	Mean per cent.
Dry substances	Way,	12.4	Way,	41.1	28.1
Protein	Wolf,	1.6	Ritthman,	6.0	3.1
Fatty substances.	Sheerer,	0.3	Way,	1.5	0.8
Nitrogenous substances	Volker,	3.5	Way,	22.8	12.1

"What can be done with a mean where such differences as these occur in regard to the ingredients of animal aliments? If the mean be taken as the standard of the nutritive value of the grass in question, would it not be likely to be wrong nine cases out of ten? But such differences as these are frequently met with in the chemical analysis of aliments, and are, therefore, very unreliable in making our calculations upon the value of a certain kind of food. But since the husbandman cannot always have exact investigations made as to the composition of the aliments, and even if he should have an occasional opportunity to do so, he will, nevertheless, be continually called upon to exercise his own judgment in regard to their chemical contents. He will rely upon the mean only in as far as it may assist him in attaining a more likely result, and will only fix upon their nutritive values by taking into consideration how those chemical ingredients act upon and modify each other, both as to their fibrine and protein contents. Should his education be such that he fully understands how this chemical combination is brought about, the results are, as a matter of course, more easily arrived at.

"I have, therefore, attached a set of practical tables in the second edition of my book on the '*Proper Feeding of Horned Cattle*,' in which I have given both the maximum and minimum figures as to the nutritive values of the most commonly used aliments of our domestic animals. Such tables always have this advantage, that they continually remind us of the many variations in the different analyses made of vegetable food, and that it is not only necessary to *calculate in figures*, but also to *make choice of correct starting points from which to make our calculations*. Now, in making our estimates hereafter as to the quantity of fibrine and protein to be given our cattle as food, let us take their live weight as the starting point. This is not quite constant; it may vary from one to five and more pounds on the hundred. But the average weight taken at the same time of day, and a little before feeding time, will serve as a sufficient point of commencement for our purposes. But a very weighty point, after all, is, *that the required nutriment of our animals, even of the* *same breeds, is not always in relative proportion to their weight, as is generally assumed.* I know of no circumstance that would have become more detrimental to our German cattle-breeding than the assumption of a simple relation between live weight and the required food of the animal, especially since the hay-value theories have been in vogue. Insomuch as it was regarded as a fact beyond all doubt that all kinds of animals require about one and two thirds pounds of hay-value per day to keep up the functions of life on every hundred pounds of live weight, and that all food beyond that went toward production, the German cattle and sheep-breeder inquires as to the live weight; generally only asks what quantity of wool or how much milk has been produced, and believes himself able to determine from these facts alone what the profits are. And yet a sheep of seventy pounds may possibly produce three pounds of wool cheaper than another—that is, may require less food than one of sixty pounds, which produces two and four-seventh pounds, and yielding the same amount of wool in proportion to its live weight. Nor is it requisite that the latter should be wanting in healthy development; it may be entirely within its usual form, as is usually found among Merinos, whilst the former, when, of course, compared to the latter, would have a broader and deeper build of body, and all those characteristics which tend toward a consumption of greater quantities of food. Nor is it necessary to adduce different breeds. Even among the same breeds of different flocks, and of the same flock, there are found animals that vary in the usual portion of food required to their live weight. The same is true of horses, heifers, and swine, as well as sheep. A comparison may be undertaken upon the relative production (profit) of a certain given amount of food upon one of our English breed of swine and one of our common breeds. One will soon be convinced that that relation is an unequal one, and that the English swine requires less food to the hundred weight. This difference is grounded in the different formations of body, and in the nature and digestive capacity of the assimilating organs. The individual character of common animals does not only express itself in its outward development of body, but through the elementary formations and functions of the same; the assimilating power, as well as of digesting food, being greater in some than in others.

"Experiments made in that direction still leave us much to be investigated; but this much we already know, that the entire weight of the empty intestines is never to be reduced to the simple proportion existing in the live weight of the animal.

"Dr. Grouven found, in thirteen slaughterings, that the weight of the empty stomach, small intestines, colon, etc., varies, depending upon the breeding and habits of the animal, and that it is not proportional to the live weight, but amounts to about from four to seven per cent. of the same. Here are differences of weight that are nearly as one to two; and now what may not be the existing difference in the various organs among themselves as well as their relative development in certain animals—differences that are not without their results upon the physiological functions of these organs—not without results upon their digestive capacity?

"And now what differences are not found even in animals of the same breeds or race? Let us adduce a few examples.

"Henneberg and Stohmann found this difference at the fattening of two oxen of the Gottinger kind. Whilst the limits of the point were arrived at where chopped beans and the quantity of protein could be reduced and the quantity of starch increased, in an ox of 1,100 pounds, fed on 6 4-10 pounds of starch, with 4 3-10 chopped beans, an ox of 1,300, relatively fed in the same manner, admitted ½ pound of starch to 4 pounds of sugar, and aside of this, but ½ pound of chopped beans. Counting the first ox at 1,100 pounds, this would be 6 1-10 pounds starch, 3-10 pounds sugar, and -410 chopped beans.

"The entire nutritive value of the ration of ox No. 2 was 1 7; with ox No. 1 it was 1.46. These palpable variations in the two animals must be sought in the individual organization of the two animals; for ox No. 1, as was shown by after experiments, was much more inclined to indigestion than No. 2; but, on the other hand, that sugar is much easier to digest than starch. A variation of like kind was found in three oxen, at Salzmünde, when fed upon rye straw. Dr. Grouven here remarks that the digestive capacity of the three oxen has been relatively the same, as nearly the same organic mess of straw was digested, viz: from 48.8 to 51.8 per cent. of the whole amount consumed by them. But it is, after all, a very unlikely one, in respect to separate ingredients in this mess; that is, *as to the unanalyzed* nutritive values of it; for we see that ox No. 2 had a better digestive capacity for protein than ox No. 1, and even ten times that of ox No. 3. Even as to the digestion of fat, No. 2 produced greater results than No. 1, and twice as much as No. 3. On the other hand, the latter had a surprising digestive capacity for non-nitrogenic extracts, for, under like circumstances, he digested nearly twice as much as the other two oxen taken together.

"A more striking example of the individual diversity of our useful animals is scarcely to be desired. Besides, it is a matter of every-day experience to those who have anything to do about cattle or animals generally; and even all of our men and maid servants know that some animals 'keep in better order' on the same quality of food than others do. Only our doctrinarians, who base everything upon the relation of live weight and required food, do not seem to understand it; and yet they have made discoveries by it, but the doctrine has rather obscured their views. But the practical Englishman, who pays no attention to hay values, never believed this dogma, but rather founded his system of breeding upon the contrary; and, indeed, to such a degree that his object was to bring about an individual capacity in his animals to assimilate food, as is manifested in his best breeds of Short-horns, Southdowns, etc. With the German breeder all successful breeding was removed by holding to the doctrines as cardinal points. *For it is not what animals produce, but what the production costs, that constitutes the main question. Cattle-raising, not the greatest but the cheapest yield, is the one that is most profitable.* As long as the idea is prevalent that certain races of animals require a fixed amount of food in proportion to their live weight (as Weckherlin declares, 1-60 of the live weight is required in hay values to preserve the ordinary functions of life, say of production in a heifer, and 1-40 to keeping up those of a sheep), so long will all developing progress in cattle-breeding be out of the question—so long will the view of the matter be diverted from the main question, only asking what the highest production has been in proportion to the live weight, but never what the cost has been, or whether the animal in question is a good or bad 'keeper.' It is true, calculations are also made in regard to the expensiveness of the food, but only founded upon that unhappy principle, that the food required is always in exact proportion to the live weight, and that one need only know the difference between that of sheep and that of a heifer to know what is needed. But hereby the investigation of the most momentous point, the testing of the individual need of required food, is left out of the question. It is not until this individual peculiarity influencing the amount required of food in a single animal is strictly examined, and its digestive capacity and assimilating power is improved in a breed in a general way, when our useful animals are not regarded from the maximum of wool or milk they produce, but are measured by the assimilating power of an animal from the food it consumes, and not until then has the *breeding of animals attained its proper* *basis*, whatever other tendency it may happen to have notwithstanding. It may be justly said that much has been on the advance with us—namely, that the acquaintance with the *forms* of the best English races but verged toward giving attention to the *general external* corporeal development of cattle-breeding. But it is rather a concession to the tendency of the times, than a clear and thorough knowledge of that which is most necessary. Not until this doctrine shall be declared false, not until this teaching of proportion of required food to live weight be pronounced untenable, will it be possible to unbandage the eyes of progress; not until then will the question of assimilation of food receive the attention it deserves. Then the forms will no longer remain the object of the breeder, but rather the development of the physiological functions of which such forms are a characteristic, but not always *a full expression*. For the great diversity existing between the Weende and Salzmünde oxen, upon which the experiments were made, should certainly have called the question of digestive capacity into consideration.

"And now, as to the daily rations of the animal, the mass of dry substance may vary quite considerably. It is true a uniform plan of feeding is the best one, but a gradual transition to a change in the quantity of dry substance can be of no detriment whatever. But it is a great mistake to insist that it should be fed in a certain relation to the live weight of the animal, and that its nutritive value is so regulated; for example, that a cow of 1,000 pounds live weight should consume 26 pounds of dry substance per day. The mass of dry substance may be 24 or 28 pounds; in fact, the amount varies in young cattle from 15 to 35 pounds to the 1,000 live weight, and even these figures do not limit the possible extremes. Most certainly we would approach the minimum when it is only desired to keep non-working oxen, whilst the maximum would condition a less perfect digestion of its nutritive qualities. But it is best to *take the mean* in the feeding of our useful animals; but it makes a decided difference whether I am to give a milk cow just 26 pounds of dry substance a day, or when it may seem indifferent what the daily rations may be, only so there is sufficient amount of nutritive substance fed, be it a little more or less of the one, provided the whole is sufficient. For if I know about how much is necessary a day for a day's feeding, I can prepare myself beforehand; for everybody that has been obliged to make provision for a large herd of cattle well knows what there is in the fluctuating prices of bulk food in case of an inclement season. It is much easier to keep a supply of the more concentrated kinds of food on hand, for the market is more stable; and it is not so difficult to determine the chemical contents in protein, fatty substance, and carbo hydrates.

"Whilst we are left more to the chance of the seasons, an eventual supply may be too costly when most needed. To buy oil-cakes is generally remunerative, and is universally done, whilst the purchase of hay or straw is seldom so regarded, and is not a commendable sign in point of adequate provision.

"Now in regard to the substantial contents of food, there is none more important than that of protein, for, according to the experiments made at Weende and Salzmünde, it has been shown that the nitrogenous ingredients of food are subject to various degrees of digestibility. Henneberg and Stohmann found that the nitrogenous contents of cracked beans were completely digested, whilst only 26 per cent. of the nitrogenous substance of wheaten straw was assimilated by the digestive process; of oat straw, 49 per cent.; of bean straw, 51 per cent.; of clover hay, 51 per cent.; of meadow hay, 60 per cent.

"A still more unfavorable assimilation was noticed in the experiments of Dr. Grouven. He speaks in regard to the results of his investigations as follows: 'Perhaps we shall be obliged to leave the protein contained in our feedings of straw quite out of the question, inasmuch as it usually reappears in the excrements as undigested. Still the results of experiments made in regard to the digestibility of the protein in straw remain in direct contradiction, yet it remains to be inferred that about the half of all nitrogenous substances contained in the coarser fodders, and that in case of straw used for wintering over, a less proportion than even that is digested.'

"Then, in proportion as we have greater quantities of coarser fodders on hand, and the more of straw we are obliged to use at our winter feedings, the more preparations we are obliged to make to supply the nitrogenous substances in the daily rations of our animals. There is much stress to be laid upon the rations that are rich in protein. This would of course find its limits in the consideration for which an animal was kept. It would be less remunerative in a cow kept for the purpose of producing milk than in cattle intended for slaughter. On the other hand, where there is too small a quantity of protein in food, the non-nitrogenous properties are never thoroughly used up in digestion. Haubner fed 2¼ to 2½ pounds of winter straw, and in connection with this, 2 pounds of potatoes per day and per head to a flock of wethers. The latter were thoroughly digested. At 3 pounds a significant quantity of starch passed with the excrements, but when with these 3 pounds ¼ of a pound of peas were fed—a food very rich in protein—all passing off of starch was arrested. It is just so with cattle in feeding food rich in carbo hydrates without containing sufficient protein, in which case the former leaves the body undigested, in which condition it is worthless even for the manure heap. On the other hand, when even a portion of the protein remains undigested, or when it adds nothing to the production of meat or milk in feeding, it has been determined by Henneberg and Stohmann, that although the protein food was the most expensive, it was still found to be fully remunerative by its worth when upon the manure heap, even if undigested, taken at the market value of the best artificial manures. This has at least been fixed, that the nitrogenous ingredients of food make up the principal combinations of food for animals, and also contain a rich portion of phosphoric acid, which very much heightens its value in the manure heap. It is of much value to know that the maximum quantity of nitrogenous substances and phosphates desired in our artificial manures cost us less, even after using them in the above forms of food, than guano or bone-dust. I therefore hold that in most cases it is much more advisable to feed food that is *rather rich in protein* than food that is wanting in nitrogenous ingredients, even though it should appear to be the most expensive nutriment. It is at least attainable by this means to reach the full value of the carbo hydrates by making them useful as a manure, which they would otherwise not have been, and so in a manner make up for all the extra cost.

"It is highly important that there should be a sufficient amount of fatty matter in food. Crusius already drew our attention to the importance of the influence of fatty matter in the digestion of proteins and carbo hydrates, and especially upon those containing fibrous tissue. A food rich in fatty matter has been auxiliary to digesting 54 per cent. ligneous fiber; in feeding one less rich, 34 per cent. was absorbed by digestion. The most recent investigations have shown that fatty substances are very useful as the combinations of food, but that they are more digestible in one kind of food than in another. Only about one third of the fatty substance was assimilated through digestion, according to the experiments made at Weende. This was quite in accord with the experiments made at Salzmünde, where, while fixing upon the digestibility of waxy (cerous) and resinous substances, it was found that from 20 to 40 per cent. of fatty matter was digested from the straw. Oil, fed in the daily rations, or the oily contents of grains, will serve as a basis of experiment, and the more of the coarser fodders we feed the more care we must take to supply fatty matter from other sources. In regard to non-nitrogenous compositions, we may again be reminded that formerly woody fiber (ligneous tissue) was considered as indigestible, whilst non-nitrogenous solubles were regarded as being easily assimilated through the digestive process. But the experiments of *Haubner*, *Stöckhardt*, *Süsdorf*, and others, have shown that quite an important portion of woody fiber *is* digestible, and that non-nitrogenous ingredients are only partially assimilated. Here, then, the former experiments on nutritive values, which fixed to one part of nitrogeous ten parts of non-nitrogenous substance, must be considered as quite untenable. However, Henneberg and Stohmann found in their numerous experiments that the amount of non-nitrogenic substance in food remained undigested in a manner to compensate for the digested ligneous fiber, so that a calculation upon the non-nitrogenous constituents of food is still admissible. Dr. Grouven, on the contrary, found that such compensation did not take place.

"It must not be overlooked here that our figures in regard to the feeding of non-nitrogenous food are the most unsatisfactory. Inasmuch as the observations of Henneberg and Stohmann are more in accordance with the object of *keeping* and *fattening* of cattle as it is usually done, whilst Dr. Grouven rather deduced his results from rations that were not in themselves sufficient to keep up the functions of life, it is best to cling to the compensation ideas of Henneberg, and to take the non-nitrogenic substances into consideration without becoming painfully exact in regard to the figures in our tables. *The main point ever remains* this: that we be sure to feed out stock a relatively sufficient amount of proteinic and fatty substance-bearing food with the assigned amount of dry food we are accustomed to give them. We must bear in mind that in our calculations upon food for cattle, the main object ever remains to give our measures a rational basis, but that we must always be governed to some extent by the nutritive effect the food has upon them, and the course of digestion it is submitted to in their bodies. By this means we not only discover the propriety or impropriety of our feedings, but will always be well enough informed to make any necessary corrections. The simple empiric who cares nothing about such hints deprives himself of all principles in his judgment relative to the matter of feeding, and is liable to lose himself in a labyrinth of errors. I may safely conclude that the present condition of our knowledge in regard to the principles of scientific feeding does not leave us without good advice, although we are deprived of the illusion of disposing of feeding-rules, as we were supposed to have overcome all difficulties when we had solved a simple rule of tables and figures."

LIME IN CROPS.

Limestone soils are far more fertile and lasting than sandy or freestone lands. The reason is, that all crops require more or less of lime, while sand is of very little use for crop food. Besides, all limestone, which is the base rock in limestone lands, always contains several other original elements in addition to lime, such as manganese, sulphur, magnesia, soda, &c., &c., which are continually disintegrating, and, by percolation, renewing the dirt above the rocks with these elements. There is comparatively little of any one element taken from the soil in the production of our crops. Professor Caldwell, before the Elmira Farmers' Club of New York, gives the amount of lime required for some of the most common staples, as follows:

"The total quantity of lime taken up from the soil of an acre by an average corn crop of fifty bushels of sixty pounds to the bushel, and 6,000 pounds of stover, would not exceed twenty-five pounds. A good crop of clover, 5,000 pounds of hay in two cuts, would require about 120 pounds of lime. A crop of wheat of twenty-five bushels, with 2,500 pounds of straw, would not require more than ten pounds. A fair crop of potatoes, 9,000 pounds or 150 bushels at 60 pounds to the bushel, would not need more than three pounds. A crop of 20,000 pounds of beets only seven pounds, and of 3,000 pounds of timothy hay about thirty-four pounds of lime. When we look a little further into the matter, and see how small a proportion of this lime is actually exported from the farm in the crops ordinarily sold, and how large a proportion goes back to the soil from which it came in the manure, the little need of taking pains to supply lime to plants for food will become still more plainly apparent. On any well managed farm the hay is usually all eaten by the stock, so that none of the lime in that part of the produce of the farm is exported; what little is retained by the young growing animals for the production of bone substance is more than made good by the lime in the water which the animals drink; in cases where a careful comparison has been made between the composition of the manure of a mixed herd of cattle, more lime has been found in the total manure than in the total fodder supplied, and this excess could have been derived from no other source than the water. The lime in the clover and timothy is not then lost to the farm, if the manure is cared for in any decent manure; the same is true of the wheat and other straws, of the cornstalks and the roots. But in the acre's yield of Indian corn, taking the grain alone, there are only about two pounds of lime, and in the wheat but little more than one pound. In the other cereal grains we should have similar insignificant quantities of lime; and even if the potatoes are sold off the farm, as is often the case to a large extent, the stock of lime in the soil of every acre producing potatoes is diminished to the extent of only three pounds. At these rates of demand it would take a long time to make much impression on the reserve supplies of lime in the soil, when such reserves amount to from 1,600 to 2,000 pounds."

FENCING AND SHED POST.

The idea prevailed for many years with most persons, and probably does to-day, that the best post timber is cedar and locust. Experience has taught us that sound white or burr oak will last just as long, and makes just as pretty a post, as either the others. The post should be made one inch less at the ground than the top, so that the water would run off instead of into the cellular tissues of the wood. The top should be sloped or rounded, and a little charred or dipped in tar or pitch, which will render them impervious to the moisture. Bore with an inch auger into the bottom of the post a hole the depth the post sits in the ground, fill it full with salt, and plug tightly with a wooden pin, by this means the post is prevented from rotting for a greater number of years. In fact, experiments have shown that thus prepared they will last fifty and seventy-five years, and perhaps longer. If it is too much labor, and thought to be too expensive for fencing, it might be tried with posts for sheds and other buildings where they are required. Plant the post blossom end downward, so that the sap will not run up.

IMPROVING CATTLE.

In no other branch of agricultural husbandry has there been so much improvement, within the last twenty-five years, as in the breeding and improving of cattle, and this has been the case, notwithstanding the shrinkage in the ordinary receipts from the farm. A great deal more might have been done, and still remains to be accomplished. In every part of our State we meet with this improvement, although cows of the old unimproved breeds are still more numerous than grades, and the cattle offered for either beef or milking purposes, in a great majority of cases, are such as must be sold at prices that pays the farmer little or nothing for profit on feeding; while good fat, close-grained, heavy beeves, suited for exportation to the eastern cities, or to foreign countries, are comparatively few. Notwithstanding this, the better grades are steadily on the increase, and improvement from year to year is everywhere visible. No part of the United States shows better or higher bred cattle than are to be found in the herds of many of our breeders. This is evident from the high prices paid for both males and females of Kentucky growth as breeders, not only by our own citizens but by cattle fanciers in other States, and even for export to England.

At our fairs, as well as at those of neighboring States, "the Blue-grass stock of Kentucky" has become famous, and more frequently carry off the first premiums than those from other sections. These exhibitions and the Grange societies, aided by the intelligent agricultural press of the country, have been the means of convincing our farmers of the great folly of breeding from any but the best bloods. The early maturity and great thriftiness of well-bred stock, even of grades, and the higher price they command, compel our farmers, who are always wide awake to their own interest, to seek for that class of animals which will take the least food to supply the vital forces, and which are the best adapted to convert grass, hay, and corn into meat and tallow at the cheapest rate.

The first settlers in our State brought with them the common scrub cattle of Virginia and North Carolina. There was one greatly-to-be-admired point in favor of this scrub stock, viz: they were the very best suited to the careless ways followed by many of our farmers. They could live where well-bred cattle would perish.

In a new country this is a good point; but now with us it is, in reality, a strong argument in favor of well-bred stock, whether thorough-breds or grades. Their introduction will compel the negligent farmer to redoubled energy, and to better care of fine stock that he may design to use as a chemical laboratory through which he is to change his provender into salable meat or dairy products. There must be more thorough cultivation. Clover, grass, and grain of the very best kinds must be provided in abundance, to take the place of coarse feed and weeds. Root crops must be grown. Farmers must attend more to enriching their lands and improving the breeds of their live stock, and devote less attention to isolated crops, like tobacco and hemp. Then there will be more rich fields, and a greater supply of such cattle and mutton as will be suited for the great shipping demand to foreign countries. Our exports from the farms will be larger, and the profits to the soil-tiller and stock-breeder greater. What it here said of cattle is equally applicable to the improvement of sheep and swine.

VINEYARDS.

Kentucky is well adapted to grape culture and wine-making. A large portion of the State is mountainous, with a climate very similar to that of parts of France and Spain. Throughout this entire mountain section grapes grow wild most profusely, but these are small, and not well adapted for wine-making; yet their normal growth proves the fact that the soil and climate are suited to the production of the grape-vine in great perfection. The wild grape is not confined to the mountain counties. We find it quite abundant, and of several varities, all over the State, everywhere growing with remarkable luxuriance. The frequent sudden changes in the temperature of our atmosphere, possibly, may cause our climate not to suit the more tender varieties of foreign grapes, although those vines produced from native stocks or seedlings, and improved by cultivation, seem to flourish here as well as in any other section of the Mississippi Valley. The calcareous limestone soils that prevail over more than three fourths of our territory supply the best of plant-food for the vine, and indicate that wine-making could be as profitably conducted here as upon similar soils in Europe.

Under-drainage (tile-draining), no doubt, is necessary for vineyards in most localities, owing to the large amount of yearly rain-fall (44 inches average) that causes our State to be so prolific in grasses and grain crops. If, however, any one desirous of starting a vineyard will become posted upon the best way of planting and training vines, which is explained in books now accessible to all, he will find no difficulty in producing such crops of grapes as will prove in everyway satisfactory, both in quality and quantity. Some vines, such as the Scuppernong, are more prolific in Georgia and Alabama than in Kentucky; yet even these, when planted on the southern exposure of a hill, do well in our State.

The five standard vines for this section of the Mississippi Valley seem to be the Concord, the Ives' Seedling, the Delaware, the Hartford Prolific, and the Catawba. Other vines do well, but none appear to suit all the conditions of our climate so well as these and similar hardy varieties, which have originated upon American soil. The Catawba is not so hardy as formerly, doubtless owing to the fact that it has lost vital power from frequent grafting with buds taken from branches distant from the main stem, or else from slips cut at a distance from the main trunk, and at a distance from the base roots.

All plants (grapes included) lose vital force by grafting, as can be seen every year, when seedlings bear abundant crops, while grafted trees or vines succumb to the spring frost or the winter freezes. Our peach and apple-growers have learned this fact by oft repeated experiments. But this loss of vital energy is not so great, when the buds or shoots are taken from near the heart or main trunks and roots of the parent plants. Frequent grafting for several generations of slips taken from the ends of branches distant from the heart of the main body, produce weakened plants, whose sap or juices are so sweet, and whose woody fibres are so flaccid that they become the ready prey for numerous parasites of both animal and vegetable natures; and vines thus propagated produce grapes or berries that look well until the time for seed-forming arrives, when the life energy of the plant fails, and nature is unable to complete, with the vital forces at her command, the exhausting process of seed production, and in her collapse hands over the unmatured berry to the ravages of insects, fungi, or blight. It is doubtless from this cause that the French vine-growers have of late years been forced to import hardy stocks from America and Australia, upon which to ingraft, in order to give greater vital force, and more vigorous constitutions to their vines, and thus ward off the destructive effects of parasites and blights.

In giving his experience upon the subject of vine-growing and wine-making, Mr. Geo. W. Campbell, a scientific vintager, through the Practical Farmer, says:

"The time is approaching when this question will have a practical interest for the grape-loving public who are anxious at least to sit under the shadow of their own vines, if they cannot have also the fig trees. Grape-planters may be divided into two classes—those who know what they are about, and those who don't. The knowing ones probably need none of my advice; the others may. The novice in grape-growing had better confine his attention to a few standard and well-known kinds—if possible, those that have been well tested, and found to exceed in his immediate vicinity. The catalogue of varieties from which to select is now a pretty long one, containing many of great excellence, but which are either untested or only suited to the most favored positions. For general use, such varieties as are vigorous in growth, healthy in foilage, hardy in severe winters, and which will be reasonably productive even under a considerable amount of neglect, are most desirable; and, although this class of grapes, as a rule, are not of the finest quality, they are generally not only the most popular, but the most profitable. The Concord grape may be regarded as the type of this class, and its seedlings—Lady, Martha, Worden's Seedling, and Eva—while they retain the best characteristics of the Concord, are still sufficiently distinct to give variety, and to be valuable additions to the list of hardy or 'iron-clad' varieties suited to the wants of the people for general planting. From my experience with these varieties, I think they may all be planted with reasonable certainty of success wherever the Concord can be grown. The Lady is a large white grape of much better quality than the Concord, and ripens two weeks or more earlier. Indeed, it ripens a little earlier than any variety I have grown, and as an early grape for universal culture is the most valuable of any I have yet tested. In size of bunch it equals average Concords, and in size of the berry it is a little larger. Martha and Eva are both white grapes, also seedlings from Concord, and much alike in growth and general habit. Eva seems a little stronger grower; usually ripens a little later, and is generally regarded as of better flavor than Martha. In size of bunch and berry, as well as productiveness, they are much alike, though in color Eva is usually a paler, almost transparent green, while Martha, when fully ripe, is of a light sulphur yellow. Worden's seedling is a large black grape, desirable for early ripening, large and handsome fruit, and fair quality. It is quite distinct in flavor from Concord, fully as good, and ripens as Hartford. A much better grape than the Hartford, and does not seem inclined to fall from the bunch, even when over-ripe.

"All the above grapes may be planted in fully exposed situations, and I believe will be found profitable and reliable where any grapes can be successfully grown.

"For gardens, or for training on walls, close fences, out-buildings, or any partially sheltered and protected situation, such grapes as Delaware, Brighton, Allen's White Hybrid, Roger's Hybrid, Massasoit, Wilder, Lindley, Agawan, Salem, also No. 5 and No. 30; Croton, Maxatawney, and Rebecca, for white grapes, will also be found desirable, and generally successful with a little timely care and attention.

"Of the still newer hybrids, Black Eagle, a large and handsome early ripening grape of a very superior quality; Irving, a large white grape, also of excellent quality and good growth; and Senasqua, another black grape, large, handsome, of fine quality, and productive, will be found worthy of attention, especially by amateurs, for garden planting. They are hybrid grapes, originated by Mr. Stephen Underhill, and are among the most promising of the late introduction of new grapes.

"For all places where the season is long enough to ripen it, the Catawba is still one of the most valuable grapes. And when it can be trained upon the wall or building with a southern or eastern exposure, will succeed in many places where it cannot be ripened in open exposure.

"This list might be extended much further; but contains enough for practical purposes, and within the limits mentioned will be found reliable."

PRACTICAL RULES ABOUT LIVE STOCK.

Farmers frequently ask for rules by which they may be able to judge the weight of animals, time of breeding, &c., &c. In order to facilitate calculations on these points, I will here give a few general approximate rules applicable to stock in good order. These rules are not perfectly exact in all cases, owing to many varying conditions, but they are sufficiently reliable for common usage. The caption of each table will explain its utility:

BREEDING CALENDAR.

COVERING.	Mares 340 Days.	Cows 285 Days.	Ewes 154 Days.	Swine 130 Days.
January 1	December 6	October 12	June 3	April 30
" 6	" 11	" 17	" 8	May 5
" 11	" 16	" 22	" 13	" 10
" 16	" 21	" 27	" 18	" 15
" 21	" 26	November 1	" 23	" 20
" 26	" 31	" 6	" 28	" 25
" 31	January 5	" 11	July 3	" 30
February 5	" 10	" 16	" 8	June 4
" 10	" 15	" 21	" 13	" 9
" 15	" 20	" 26	" 18	" 14
" 20	" 25	December 1	" 23	" 19
" 25	" 30	" 6	" 28	" 24
March 2	February 4	" 11	August 2	" 29
" 7	" 9	" 16	" 7	July 4
" 12	" 14	" 21	" 12	" 9
" 17	" 19	" 26	" 17	" 14
" 22	" 24	" 31	" 22	" 19
" 27	March 1	January 5	" 27	" 24
April 1	" 6	" 10	September 1	" 29
" 6	" 11	" 15	" 6	August 3
" 11	" 16	" 20	" 11	" 8
" 16	" 21	" 25	" 16	" 13
" 21	" 26	" 30	" 21	" 18
" 26	" 31	February 4	" 26	" 23
May 1	April 5	" 9	October 1	" 28
" 6	" 10	" 14	" 6	September 2
" 11	" 15	" 19	" 11	" 7
" 16	" 20	" 24	" 16	" 12
" 21	" 25	March 1	" 21	" 17
" 26	" 30	" 6	" 26	" 22
" 31	May 5	" 11	" 31	" 27
June 5	" 10	" 16	November 5	October 2
" 10	" 15	" 21	" 10	" 7
" 15	" 20	" 26	" 15	" 12
" 20	" 25	" 31	" 20	" 17
" 25	" 30	April 5	" 25	" 22
" 30	June 4	" 10	" 30	" 27
July 5	" 9	" 15	December 5	November 1
" 10	" 14	" 20	" 10	" 6
" 15	" 19	" 25	" 15	" 11

BREEDING CALENDAR—Continued.

COVERING.	Mares 340 Days.	Cows 285 Days.	Ewes 154 Days.	Swine 130 Days.
July 20	June 24	April 30	December 20	November 16
" 25	" 29	May 5	" 25	" 21
" 30	July 4	" 10	" 30	" 26
August 4	" 9	" 15	January 4	December 1
" 9	" 14	" 20	" 9	" 6
" 14	" 19	" 25	" 14	" 11
" 19	" 24	" 30	" 19	" 16
" 24	" 29	June 4	" 24	" 21
" 29	August 3	" 9	" 29	" 26
September 3	" 8	" 14	February 3	" 31
" 8	" 13	" 19	" 8	January 5
" 13	" 18	" 24	" 13	" 10
" 18	" 23	" 29	" 18	" 15
" 23	" 28	July 4	" 23	" 20
" 28	September 2	" 9	" 28	" 25
October 3	" 7	" 14	March 5	" 30
" 8	" 12	" 19	" 10	February 4
" 13	" 17	" 24	" 15	" 9
" 18	" 22	" 29	" 20	" 14
" 23	" 27	August 3	" 25	" 19
" 28	October 2	" 8	" 30	" 24
November 2	" 7	" 13	April 4	March 1
" 7	" 12	" 18	" 9	" 6
" 12	" 17	" 23	" 14	" 11
" 17	" 22	" 28	" 19	" 16
" 22	" 27	September 2	" 24	" 21
" 27	November 1	" 7	" 29	" 26
December 2	" 6	" 12	May 4	" 31
" 7	" 11	" 17	" 9	April 5
" 12	" 16	" 22	" 14	" 10
" 17	" 21	" 27	" 19	" 15
" 22	" 26	October 2	" 24	" 20
" 27	December 1	" 7	" 29	" 25
" 31	" 5	" 11	June 2	" 30

CATTLE—WEIGHT BY MEASUREMENT.

To ascertain the weight by measurement, the girth is taken by passing the cord just behind the shoulder blade. and under the fore leg. This gives the circumference, and the length is taken along the back from the foremost corner of the blade bone of the shoulder, in a straight line to the hindmost part of the rump.

Girth.	Length.	Weight.	Girth.	Length.	Weight.
ft. in.	ft. in.		ft. in.	ft. in.	
4 3	3 0	180	4 9	3 3	244
	3 3	195		3 6	264
	3 6	210		3 9	282
	3 9	225		4 0	300
	4 0	240		4 3	319
4 6	3 0	202		4 6	338
	3 3	219		4 9	357
	3 6	236	5 0	3 3	271
	3 9	253		3 6	292
	4 0	270		3 9	315
	4 3	286		4 0	334

CATTLE—WEIGHT BY MEASUREMENT—Continued.

Girth	Length.	Weight.	Girth.	Length.	Weight.
ft. in.	ft. in.		ft. in.	ft. in.	
	4 3	360		5 3	797
	4 6	377		5 6	835
	4 9	398		5 9	874
	5 0	420		6 0	911
5 3	3 3	298		6 3	949
	3 6	321	7 0	4 9	776
	3 9	344		5 0	816
	4 0	367		5 3	854
	4 3	390		5 6	898
	4 6	413		5 9	939
	4 9	436		6 0	979
	5 0	459		6 3	1,020
5 6	3 6	352		6 6	1,061
	3 9	378	7 3	4 9	832
	4 0	403		5 0	868
	4 3	428		5 3	919
	4 6	453		5 6	963
	4 9	478		5 9	1,007
	5 0	504		6 0	1,051
	5 3	529		6 3	1,095
5 9	3 9	413		6 6	1,138
	4 0	440	7 6	5 0	937
	4 3	468		5 3	984
	4 6	495		5 6	1,031
	4 9	523		5 9	1,078
	5 0	551		6 0	1,125
	5 3	578		6 3	1,171
	5 6	606		6 6	1,218
6 0	4 3	510		6 9	1,265
	4 6	540		5 0	1,001
	4 9	570	7 9	5 3	1,051
	5 0	600		5 6	1,101
	5 3	630		5 9	1,151
	5 6	660		6 0	1,201
	5 9	690		6 3	1,251
	6 0	722		6 6	1,301
6 3	4 6	585		6 9	1,351
	4 9	618		7 0	1,400
	5 0	651	8 0	5 3	1,120
	5 3	683		5 6	1,173
	5 6	716		5 9	1,226
	5 9	748		6 0	1,280
	6 0	781		6 3	1,333
	6 3	814		6 6	1,386
6 6	4 6	633		6 9	1,440
	4 9	668		7 0	1,493
	5 0	704	8 3	5 6	1,247
	5 3	739		5 9	1,304
	5 6	774		6 0	1,361
	5 9	809		6 3	1,417
	6 0	844		6 6	1,474
	6 3	882		6 9	1,551
6 9	4 6	683		7 0	1,588
	4 9	721		7 3	1,644
	5 0	759			

TABLE OF AVERAGE WEIGHTS.

PARTS OF THE BODY.	OXEN.			CALVES.
	Average size.	Medium	Fat.	Fat.
	Per cent.	Per cent	Per cent.	Per cent.
Contents of stomach and intestines	18.0	15.0	12.0	7.0
Blood	4.7	4.2	3.9	4.8
Skin and horns	8.4	7.4	6.0	6.8
Leg as far as hock	1.9	1.7	1.6	1.9
Head	2.8	2.7	2.6	4.8
Tongue and throat	0.6	0.6	0.5	
Heart	0.4	0.5	0.5	0.6
Lungs and bronchial tubes	0.7	0.7	0.6	1.2
Liver and gall bladder	1.5	1.3	1.3	1.6
Diaphragm	0.5	0.5	0.5	0.4
Spleen	0.2	0.2	0.2	0.3
Stomach without contents	4.5	3.0	2.7	1.2
Intestines without contents	2.0	1.5	1.4	2.4
Fat of diaphragm and intestines	2.3	2.9	4.5	2.4
Four quarters, with kidneys and suet	47.4	55.7	60.3	60.0
Refuse and loss	4.1	2.1	1.4	4.6
Total	100.0	100.0	100.0	100.0
Combined parts.				
Blood	4.7	4.2	3.9	4.8
Skin, head, legs, and tongue	13.7	12.4	10.7	13.5
Entrails	9.8	7.7	7.2	7.7
Flesh and fat	49.7	58.6	64.8	62.4
Contents of stomach and intestines	18.0	15.0	12.0	7.0
Remaining parts of body, dead weight, including fat of kidneys, etc.				
Flesh without fat or bones	36.0	38.0	35.0	43.0
Bones	7.4	7.3	7.1	9.3
Fat in flesh	2.0	7.9	14.7	5.5
Fat in kidneys	2.0	2.5	3.5	2.2
Fat in diaphragm and intestines	2.3	2.9	4.5	2.4
Total	49.7	58.6	64.8	62.4
Flesh without fat or bones.				
Dry substance	8.0	8.4	7.5	8.8
Water	28.0	29.6	27.5	34.2
Total	36.0	38.0	35.0	43.0
100 *parts of flesh without bone, human nourishment.*				
Fat	5.3	17.2	29.4	11.3
Muscle	19.8	17.5	14.5	17.0
Mineral substance	1.2	0.9	0.8	1.1
Water	73.7	64.4	55.3	70.6
Total	100.0	100.0	100.0	100.0

TABLE OF AVERAGE WEIGHTS—Continued.

PARTS OF THE BODY.	OXEN.			CALVES.
	Average size.	Medium.	Fat.	Fat.
Various parts in living animal.	Per cent.	Per cent	Per cent.	Per cent.
Fat	7.1	14.9	26.8	13.1
Nitrogen	15.8	15.5	13.7	15.3
Mineral substance	4.8	4.4	3.9	4.5
Water	54.3	50.2	43.6	60.1
Contents of stomach and intestines	18.0	15.0	12.0	7.0
Total	100.0	100.0	100.0	100.0
Deducting contents of stomach and intestines.				
Fat	8.7	17.5	26.8	14.1
Nitrogen	19.2	18.3	18.9	16.5
Mineral substance	5.9	5.2	4.4	4.8
Water	66.2	59.0	49.9	64.6
Total	100.0	100.0	100.0	100.0
Mineral substance in 100 *parts of living animal.*				
Phosphoric acid	1.92	1.76	1.56	1.64
Lime	2.14	1.96	1.74	1.93
Magnesia	0.06	0.06	0.05	0.06
Potash	0.18	0.16	0.14	0.29
Soda	0.14	0.13	0.12	0.07
Silicic acid	0.02	0.01	0.01	0.01
Sulphuric acid	....	....	....	....
Chloric and carbonic acids	0.34	0.32	0.28	0.50
Total	4.80	4.40	3.90	4.50

TABLE OF AVERAGE WEIGHTS

PARTS OF THE BODY.	SHEEP.					SWINE.	
	Lean.	Average.	Medium.	Fat.	Very fat.	Average	Fat.
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Contents of stomach and intestines. .	16.0	15.0	14.0	12.0	10.0	7.0	5.0
Blood	3.9	3.9	3.6	3.2	3.2	7.3	3.6
Skin and horns . . . . }	9.6	9.3	8.0	7.2	6.5	. . .	. . .
Leg as far as hock . . . . }							
Wool washed	5.0	4.7	4.3	4.0	3.6	. . .	. . .
Wool dirt	4.8	4.5	4.0	3.6	3.2	. . .	. . .
Head . . . . }	4.6	4.3	3.7	3.2	2.8	0.5	0.4
Tongue and throat . . . . }							
Heart	0.4	0.3	0.4	0.3	0.2	0.5	0.3
Lungs and bronchial tubes	1.5	1.5	1.2	1.0	1.0	1.4	0.9
Liver and gall bladder	1.4	1.5	1.3	1.3	1.0	2.6	1.7
Diaphragm	0.3	0.3	0.3	0.2	0.2	. . .	. . .
Spleen	0.2	0.2	0.2	0.1	0.1	0.2	0.2
Stomach without contents	2.4	2.3	2.3	2.0	1.5	1.2	0.7
Intestines without contents	2.3	2.2	1.9	1.7	1.3	3.9	2.2
Fat of diaphragm and intestines. . .	3.0	4.1	4.9	6.8	8.0	1.7	2.5
Fore-quarters, with kidney and suet .	43.3	45.3	49.4	52.8	57.1	72.8	82.1
Refuse and loss	1.3	0.8	0.5	0.6	0.3	0.9	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Combined parts.							
Blood	3.9	3.9	3.6	3.2	3.2	7.3	3.6
Skin, head, legs, and tongue	24.0	22.8	20.0	18.0	16.1	. . .	. . .
Entrails	8.5	8.1	7.7	6.6	5.3	9.8	6.0
Flesh and fat	46.3	49.4	54.3	59.6	65.1	74.5	84.6
Contents of stomach and intestines. .	16.0	15.0	14.0	12.0	10.0	7.0	5.0
Remaining parts of body, dead weight, including fat of kidneys, etc.							
Flesh without fat or bones	33.2	33.5	33.1	29.0	27.0	46.4	40.4
Bones	7.1	6.6	5.9	5.5	5.2	8.0	5.8
Fat in flesh	2.0	3.3	8.0	14.7	20.5	16.5	32.4
Fat in kidneys	1.0	1.9	2.4	3.6	4.4	1.9	3.9
Fat in diaphragm and intestines . . .	3.0	4.1	4.9	6.8	8.0	1.7	2.5
Total	46.3	49.4	54.3	59.6	65.1	7 .5	84.6
Flesh, without fat or bones.							
Dry substance	6.8	6.7	5.4	6.3	5.1	8.1	7.3
Water	26.4	26.8	23.6	26.8	21.9	38.3	32.7
Total	33.2	33.5	29.0	33.1	27.0	46.4	40.0
100 *parts of flesh, without bone, human nourishment.*							
Fat	5.7	9.0	19.5	33.6	43.2	26.2	45.5
Muscle	18.0	17.1	14.5	11.7	10.2	12.3	9.7
Mineral substance	1.3	1.1	0.8	0.7	0.6	0.6	0.4
Water	75.0	72.8	65.2	54.0	46.0	60.9	44.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE OF AVERAGE WEIGHTS—Continued.

PARTS OF THE BODY.	SHEEP.					SWINE.	
	Lean.	Average.	Medium.	Fat.	Very fat.	Average.	Fat.
Various parts in living animal.	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Fat	8.6	13.2	18.3	28.1	37.2	22.5	40.2
Nitrogen	15.4	14.8	13.8	12.2	11.0	13.9	11.0
Mineral substance	3.4	3.3	3.2	2.9	2.8	2.7	1.8
Water	56.6	53.7	50.7	44.8	39.0	53.9	42.0
Contents of stomach and intestines	16.0	15.0	14.0	12.0	10.0	7.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Deducting contents of stomach and intestines.							
Fat	10.2	15.5	21.3	31.9	41.4	24.2	42.3
Nitrogen	18.3	17.4	16.0	13.9	12.2	15.0	11.9
Mineral substance	4.0	3.9	3.8	3.3	3.1	2.9	1.9
Water	67.5	63.2	58.9	50.9	43.3	57.5	43.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mineral substance in 100 *parts of living animal.*							
Phosphoric acid	1.33	1.29	1.25	1.13	1.09	1.10	0.73
Lime	1.40	1.35	1.31	1.19	1.15	1.15	0.77
Magnesia	0.05	0.04	0.04	0.04	0.04	0.05	0.03
Potash	0.16	0.16	0.15	0.14	0.13	0.15	0.10
Soda	0.15	0.15	0.14	0.13	0.12	0.10	0.07
Silicic acid	0.02	0.02	0.02	0.02	0.02	. . .	. . .
Sulphuric acid	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Chloric and carbonic acid	0.29	0.29	0.29	0.25	0.25	0.15	0.10
Total	3.40	3.30	3.20	2.90	2.80	2.70	1.80

In using horses or cattle for plowing purposes, it saves time to have the rows as long as possible, as is evidenced from the following table:

COMPARATIVE TIME LOST IN TURNING AT THE ENDS OF LONG AND SHORT FURROWS.

Length of furrow.	Breadth of furrow.	Time lost in turning. Hours.	Time lost in turning. Min.	Time devoted to ploughing. Hours.	Time devoted to ploughing. Min.	Hours of work.
234 feet.	10 inches.	5	11	4	4	10
447 feet.	10 inches.	2	44	7	16	10
600 feet.	10 inches.	2	1	7	59	10
636 feet.	10 inches.	1	56¼	8	3½	10
822 feet.	10 inches.	1	28	8	32	10

CONDITION OF CROPS.

In order to give a general idea of the condition of the crops for the year 1878, at their different stages of growth, and also to show the correctness of the monthly estimates, given from the correspondence of this office, I will here insert three of my crop reports, dated respectively April 1, July 1, and October 1, 1878:

MONTHLY REPORT FROM THE BUREAU OF AGRICULTURE, HORTICULTURE, AND STATISTICS.

FRANKFORT, KY., April 1, 1878.

The month of March has been unusually mild and uniform in its temperature. The growth of all classes of vegetation is considerably in advance of what it generally is at this season of the year. February was a wet month throughout the State; consequently, there was less winter ploughing done than was desirable; but the farmers have nearly balanced this deficit by extra exertions during the month of March, so that now the preparations for early spring planting are fully average. The present condition of the live stock is good, although less corn and other grain have been fed than usual, owing to the fine winter pasturage from the grasses and small grain crops. It is too early to tell the exact extent of the staple crop planting for the coming spring and summer, but we are enabled to gather, from our varied reports, a tolerably fair estimate of the views now entertained by the farmers.

Wheat.—This staple is growing more in favor every year with our farmers. It was sown last fall from 10 to 12 per cent. above average in quantity, and its present condition is as fine as was ever known at this time in the year; in fact, wheat in many neighborhoods is too forward, and is now growing so rapidly that there is danger of its being injured by a hard frost in April or May. The drilled wheat is in better condition than that sown broadcast. The favorite varieties seem to be the Tappahannock, the Broughton, White Clarosan, Fultz, Reed, Red May, and Mediterranean. I have received notes of several interesting experiments on a small scale during a space of five years, where, by selection of choice heads for seeding and cultivation in drills, the heads have been increased from 4½ inches up to 8¾ inches, and the number of grains in a head from 45 to 120, while the number of ears to the stool has been increased from 10 to 50. The seed were planted, one in a place, nine by nine inches, and the plants cultivated in the spring. From seed thus improved, an acre of ground, drilled in the ordinary way, produced 57 bushels, while an adjoining acre of other wheat produced 32 bushels.

Rye and Barley.—These crops are looking well, and have been seeded in acreage 105. They are every year becoming more popular, both for grazing purposes and the yield of grain for the use of breweries and distilleries.

Grass, Oats, and Clover.—There has been sown this spring a larger breadth of these crops than for several years. This is owing, in a great measure, to the low figures at which grass and clover seed can be purchased, and a general feeling among our farmers to take better care of their lands by seeding more grasses and small grain, and cultivating a smaller acreage of corn, hemp, and tobacco. Oats are regaining the position they once held before rust became so prevalent every year upon the plant, which caused many sections to abandon it entirely and substitute German millet or Hungarian grasses, both of which are great exhausters of land.

Corn.—There will be planted about an average amount of this staple. The lands are not in so good order as they were last spring, owing to the lack of winter freezes and the excessive rains in February; yet the warm, balmy weather of March has been so favorable to the planter, that already a considerable amount of the corn crop has been seeded in some of the western and southern counties. Old corn is still plenty at low prices, and the shipping demand is less than usual.

Tobacco.—The old crop is coming rapidly into market, and selling at very unsatisfactory prices. The government monopolies of several European countries cause the price of this staple always to be controlled, to a greater or less degree, by the few "regie contractors," who buy and export a large proportion of the crop. No other product is so circumstanced as to be under the dictatorial influence of a few monopolists, having complete power to raise or lower its price at will, without regard to the usual laws of trade, which are governed by the supply and demand. The continual decline of prices last season, in the face of the smallest crop known for years, shows the power of these monopolists to rule the commercial value of this commodity. Congress, by special treaties, might do much to remove these unjust impositions. The plant beds sown for the new crop, as well as the land prepared for planting, are probably from fifteen to twenty per cent. less than last year, which will cause the acreage to be scarcely up to an average. The least falling off (which is caused by the low prices of the weed) will be in the Mason county and cutting districts, while the largest will be in the Hopkinsville, Paducah, and Owensboro sections of the State.

Hemp and Flax.—The old crop of hemp is being sold at very low rates, which will cause this year's crop to be sown not over an average in amount—possibly five per cent. below. The introduction of other substitutes for bagging and rope, and the use of wire-rigging upon sea vessels, have seriously injured the trade in hemp products, and the present outlook is, that this will even become more apparent in the future. If so, we may expect to find a corresponding decrease of this interest in our State. Flax has been sown to a very limited extent since the war, but there have been patented several new "brakes," which will greatly facilitate the process of preparing the lint for market, and thereby stimulating its production in the future.

Orchards and Vineyards.—More than the usual number of orchards and vineyards are being planted this spring, and the people are gaining experience in planting, as well as knowledge of the best varieties suitable to our soil and climate. Heretofore too many have bought northern trees and vines that failed when transplanted here; now a farmer or gardener rarely plants a tree or vine, except from our home vineyards and nurseries; consequently, they will obtain more reliable kinds of fruit, better adapted to the peculiarities of the Kentucky soil. Some of the peaches, pears, and cherries are killed on the bottom lands, particularly on the grafted trees; but on the highlands, ridges, and freestone soils, generally, there is an abundance of all kinds of fruit, except where it may have been injured within the last week, and which has not yet been reported. Blooms of all kinds of fruits are very early this spring, and are still in great danger from hard frosts in this month, if they occur.

Horticultural.—There is a marked improvement reported in preparations for good gardens. The people are taking more interest in having vegetables in quantities to keep their families in good provisions, more luxuries, and better health, and to save doctor's bills, which experience teaches them can be done by a little extra work on the gardens, orchards, and vineyards.

Live Stock of all kinds are looking well, and while fancy prices for horses, cattle, and sheep are not so common, yet every year shows a marked improvement in the breeds of each, and a more general desire for their increase in all sections of the State. Sheep husbandry is particularly becoming a more popular and lucrative branch of farming, and before many years this industry will rank among the most profitable in the Commonwealth. The number of horses, mules, cattle, sheep, and hogs are on the increase, but not yet up to the full average of what they were before the war.

Poultry.—No industry is growing more rapidly than the poultry interest in Kentucky. Around the cities and along the lines of railroads the increase in the poultry-yards is quite positive, and the egg and fowl markets show that our poultry-fanciers are reaping a rich harvest from their investments.

Enriching Lands.—Agriculture as a science becomes more important each year. The virgin soil from much of our lands has been washed off or destroyed by a careless, wasteful system of husbandry, until there is an imperative necessity for a change in the plan of farming hitherto pursued by most soil-tillers, in order to make this industry relatively remunerative with other occupations. Plants will not grow unless they are supplied with the proper elements for food upon which they can subsist, and from which they can form wood, leaves, and seed. These elements vary in different plants, so that what is rich food for one cannot be assimilated at all as nourishment by another. It is the duty of a farmer to know what is lacking in his soil to produce certain crops, and to supply the earth with these elements. Chemical fertilizers are most valuable when judiciously applied, but if used indiscriminately, may frequently do but little good. A large number of farmers in different parts of the State are testing these fertilizers, and nearly all have found them to pay better than any investment they have ever made. The experiments on the growing wheat bid fair to prove highly profitable, and some of them will be duly reported at harvest season through this Bureau. I would suggest to all farmers the necessity of sowing largely of clover, buckwheat, peas, rye, and millet, to be turned under in a green state, in order to fertilize the lands preparatory to seeding wheat, corn, hemp, or tobacco; also the use of superphosphates, bone-dust, salt, German kainit, and South Carolina marls upon tobacco, corn, and wheat lands, before seeding.

Nothing but a man's own experience with mineral fertilizers and green crops will ever convince him of their great advantage to crops and land, and also of the fact that no plan of farming will pay which does not restore to the lands each year the elementary constituents of plant-food removed by the staple crops. I have advised with several railroad officers, and am glad to be able to state in regard to one of the principal roads, the Louisville and Nashville and branches, that Dr. Standeford, president, a far-seeing business man and skilled financier, says that his road will carry at cost of transportation all fertilizers which are intended to improve the lands and crops. The managers of other roads will no doubt do the same as soon as they can see properly their own interests.

Fish Culture.—The Legislature has continued the Fish Commission, and if the citizens of the different counties will assist the Commission, of which Mr. Griffith, of Louisville, is Chairman, and will keep seines and fish-berries out of the creeks and rivers for a few years, our streams will abound in the best quality of game fish, such as salmon, trout, perch, &c. Ponds fed by springs or clear creeks can also be supplied with excellent fish, that can be multiplied and kept in a thriving condition as easily as any class of live stock, and thus supply the cheapest and best of food.

Turnpikes.—In many counties the people are sadly in want of good roads for travel, and upon which they can carry their agricultural products to market. Heretofore the citizens have been, in many sections of the country, unable to make suitable pikes; but now, by proper action and organization, since the Legislature has passed new laws in regard to the labor system of convicts in the Penitentiary, any county can manage to obtain a sufficiency of this labor at the expense of feeding, clothing, and guarding the criminals, to gradually build such turnpikes as may be most needed in the country.

Hard Times—The General Government has caused, by its financial blunders, the excessive pressure now bearing so heavily upon all the industries of the country. This will not cease until there is a change in the laws regulating and supplying currency; and until this is done, the safest way for farmers to act is to diversify their products in such a manner as to live within themselves, and only to sell and expend what is clearly a surplus. The plantation system of one or two staples will not pay.

W. J. DAVIE, *Commissioner.*

MONTHLY REPORT FROM THE BUREAU OF AGRICULTURE, HORTICULTURE, AND STATISTICS.

FRANKFORT, KY., July 1, 1878.

The unusual cool weather which prevailed in May continued throughout nearly the whole of June, with a severe drought, of nearly three weeks' duration, in many parts of the State. This kind of weather, though propitious for wheat and other small grain, gave a very decided "set back" to the corn, hemp, and tobacco, and in some counties severely injured the plant-beds, first by "the drying up" process, and then by hardening the stems, and growing the tobacco plants too small and "spindling."

Good rains, however, commenced about the middle of the month, which relieved the crops, and gave the farmers an opportunity to finish re-setting the balance of their tobacco crops. The last two weeks have been especially favorable for the growth of all kinds of vegetation. The high floods, coming from the rain-fall about the 16th of June, did some damage to the crops in the river and creek bottoms, and partially injured some crops of barley and wheat that had just been harvested, or that were then standing ripe in the fields; but this injury did not amount to enough to be considered in the general average of the crops throughout the State.

Wheat.—The harvest of this important staple is nearly over, being about two weeks earlier than usual. The acreage in the State was 115, but the lack of ground-freezes last winter made the stalks grow up porous and succulent, and induced the early growth of immense quantities of the fungoid parasites, known as the "rust plant," upon the blades of the wheat. The "rust plant," as I explained in my last monthly report, has three stages or growths—the first on the barberry or blackberry bushes, the second on the blades of the cereals, wheat, oats, &c., and the third on the stalks of the cereals. Fortunately this plant in many sections of the State, owing to the cool dry weather, which was unpropitious for its growth, did not get beyond the second stage before the rains of June, and before the harvesting of the crop of wheat, though, unfortunately, in many of the western and southern counties, where the largest and best crops of wheat are usually grown, and where the lands are naturally better adapted for the production of small grain, this rust plant did arrive at its third stage before the harvest season, and in time to do an irreparable injury to the crop. Accordingly, the reports from the "Kentucky Purchase" counties, and from all those counties based upon the cavernous limestone formation, as Christian, Trigg, Caldwell, Todd, Logan, Warren, Barren, &c., give a most cheerless account of the wheat yield—less than 60 in comparison with the expectations from the large acreage sown, and much of it quite shriveled and inferior in quality. In the blue limestone (blue-grass) counties, however, the rust did but little damage, and here, as well as in the mountain counties, the yield is above an average—110. In the entire State, notwithstanding the losses in the principal wheat-producing counties, the crop will average (taking five to ten years in comparison) from 97 to 100, owing to the great excess of acreage sown last fall.

Barley.—The acreage of winter barley was 100, and it has been well harvested, and presents a yield of 105. The Bluegrass counties have, by large odds, the best crops; of these, Jessamine, Scott, and Woodford excel.

Oats and Rye.—These staples in acreage were each 105, and in condition fully 105 throughout the State. My correspondents give reports of an increased attention among farmers to each of these crops, for the various uses of grain, pasturage, and as green fertilizers for worn-out lands.

Corn.—There is an increase in this crop, which stands at 110 in acreage. The "stand" is good, but the plants are much smaller than usual at this season of the year, and indications point strongly to a moderate yield. This is no doubt owing to the want of ground freezes during the past winter, which is now telling on the crops, and causing the lands to work hard and cloddy. The old Saxon adage, that "a hard winter is followed by good crops," and *vice versa,* seems about to prove true as regards the corn.

Grass and Hay.—The meadows are excellent, and pasturage superb; acreage 110, and condition 115. The hay crop will be large, and of good quality. The breadth of land sown in clover and grass is greater than it has been any year since the war.

Tobacco.—This crop has been set throughout the State in acreage about 66⅔, compared with that of last year, when there was a very large crop. The present set, compared with the average for 5 to 10 years, is about 85 to 90 in the State. The plants in the hill are generally small, and have "started off" badly. This is doubtless owing to the same causes which retard the growth of the corn, viz: want of ground-freezes last winter, and the consequent compactness and cloddiness of the soil this summer. How far these causes will operate hereafter on the present crop, we cannot now judge. The present appearances for a rich, heavy crop are not very promising. There is a disposition among the planters of Kentucky to improve the quality of this staple, and no doubt this desirable object might have been partially attained this year, while the crop planted is evidently smaller than usual;

but when the "elements are against a man," and he will not reason, or think how to counteract their bad influences by the application of counter laws that may cure the evil, through the use of a proper system of fertilization and plant feeding, what else can he do but strip and prize *just such tobacco* as his lands, exhausted of potash, lime, and nitrogen, will produce? My correspondence with parties in the tobacco-raising counties of Tennessee leads me to believe the crop in that State will be no better than in Kentucky.

Hemp and Flax.—The hemp crop is reported, in acreage and condition, at 95, the flax at 80.

Fruit Crops.—Small fruits and berries have been a success this season, and have well rewarded the gardeners and orchardists. The apples, however, were not over 60. Col. E. D. Powell, of Henderson county, the most practical and scientific orchardists in the Green river section of the State, writes that he never saw a finer prospect for plums, cherries, nectarines, apricots, peaches, and berries than is now exhibited in that part of the country, but that the apples have fallen from the trees badly. A sample box of apricots, sent me by Col. P., are superior to anything to be found in the Louisville market. The blackberry crop will be very large. In this crop Trimble county will carry off the palm.

Potatoes.—This has become a staple crop in the State, and is in acreage 110, and in condition 115. The yield bids fair to be the largest ever raised in Kentucky, although the Colorado bug has been very destructive in many neighborhoods; but the free use of Paris green and other insecticides, together with the application of "bug-killing machines," which necessity has brought into practical use, have so far held these pests under control, that comparatively little damage has been inflicted on the potato-growers.

Garden and Dairy Products are each largely on the increase in the State, and each are reported at 110, both in amount and condition.

Live Stock of all kinds are doing well, with a marked increase reported in hogs, sheep, poultry, and bees. Better breeds are being imported into the State, and the natives are being improved by "the laws of selection and the survival of the fittest." There is nearly 50 per cent. increase in the bee and honey industry of the State within the past three years, and over 30 per cent. increase in poultry. A chicken fancier writes me that the leaves of the male persimmon, put in hens' nests and about the hen-house in quantities, is a sure remedy against vermin, and prevents cholera in fowls. The honey yield this summer is very large.

There have been more than the usual number of auction sales of fine stock in the State, at nearly all of which fair, satisfactory prices have been paid for horses, cattle, sheep, and hogs.

Fence Laws.—The increasing scarcity of timber in some of the more thickly settled counties of the State warns us that it is time to begin to fix up a new system of fence laws adapted to the new order of things. In North Carolina, three or four years ago, a law was passed allowing the citizens of any county to vote a tax upon themselves sufficient to pay for making a good fence around the entire county, with first-class gates across all public highways leading into other counties. Two or more counties could also join in the same enterprise; or, in case a county refused to tax itself, then any magistrates' district could vote a tax and fence in the district, all live stock to be kept inclosed by the owners under a heavy penalty. Several counties have voted the tax and made the necessary county fences, so that the crops in these counties can be grown on the commons. They report that experience shows that the saving in labor, timber, and money, in the counties thus acting, is over 500 per cent. above the cost of the tax. I would suggest to citizens of several of the thickly-settled counties in Kentucky to have such local laws passed for their benefit by the next Legislature.

Fish Laws.—Over one million six hundred thousand fish from the artificial hatcheries have been put into the rivers and creeks of Kentucky the past spring, and if the Legislature will keep the Fish Commission in funds (even to a moderate amount) for a few years, every river, creek, and lake will be stocked with first-class game fish in sufficient quantities to supply the demand of all our citizens: *Provided, however*, that the people of each neighborhood will see to it that *no seines or fish-berries* are allowed to be put in the streams for five years to come. A heavy fine is imposed by law upon any one who use seines or berries in the rivers and creeks, and it is the duty of every good citizen to see this law enforced to the letter.

I understand that large numbers of other spawn will be placed in our water-courses the coming fall and spring. The varieties of fish already put in the streams are shad, mountain and lake trout, lake and Oregon salmon, mountain trout, and bass.

I here return thanks to my numerous correspondents for their prompt and correct reports.

W. J. DAVIE, *Commissioner.*

MONTHLY REPORT FROM THE BUREAU OF AGRICULTURE, HORTICULTURE AND STATISTICS.

FRANKFORT, KY., October 1, 1878.

In every section of the State my correspondents have noticed the remarkable capriciousness of the rain-falls during the crop growing season just past. In one small neighborhood there were gentle showers sufficient to insure a good crop, while almost a perfect drought existed within the next few miles. The consequence is, the crops of both tobacco and corn are reported to be very "spotted"—good in some places and very poor in adjoining localities. The superior ploughs, now manufactured and used in Kentucky, add greatly to the farmer's ability to fallow his land in dry seasons in time for wheat seeding in the fall; with the old-fashioned implement it would be impossible, in a dry summer, to do the work needed upon our hard-tramped clay soils.

Wheat.—The crop of this cereal grown in Kentucky last year (1877) was the largest we have harvested since the war. It amounted, according to the assessors' returns, to 7,645,604 bushels. The crop grown the past season will not be over 5,500,000 bushels, owing to the ravages of Hessian fly and rust in the chief wheat-growing counties of the southern and western parts of the State. Even our large crop of seven and a half millions of bushels appears small when compared with those raised by several of the States northwest of us. The newspaper estimates of these States are as follows: Illinois and Indiana, over 18,000,000 bushels each; Minnesota, 40,000,000; Iowa, 45,000,000; Wisconsin, 30,000,000; Michigan, 25,000,000; Nebraska, 30,000,000; Kansas, 35,000,000; California, 30,000,000; Oregon, 15,000,000; and Utah, 10,000,000. The entire crop grown in the United States in the summer of 1877 was over 360,000,000; that of 1878 will be fully 400.000,000, or 40,000,000 above an average. The estimates of many of the States may be too great, doubtless are; but they go to show how much more extensive this industry is in the northwest than in Kentucky. The crop of this State ought to be not less than 25,000,000 of bushels a year, with no more land seeded than we now sow, if our people could be made to see their own interests, and would fertilize every acre they cultivate, so that the yield might average from 25 to 35 bushels per acre, instead of from 9 to 12 bushels, as is the case at present. Within the last twenty-five years the average wheat yield in old England, by the use of fertilizers, per acre, has been increased from 16 bushels to 36 bushels. I have a letter from Col. J. D. Guthrie, of Shelby county, in which he says: "Fultz wheat has proved itself superior in point of yield from one fourth to one third more than the Alabama and other varieties, and will be almost universally sown with us this fall. Wherever bone-dust and salt as fertilizers have been sown in sufficient quantities (200 to 300 pounds of bone-dust, and 100 pounds of salt), or where clover has been turned under green, and been followed by wheat, the yield has been from 25 to 40 bushels per acre of the Fultz variety; but where the wheat has followed corn without fertilizers, the yield varies from 7 to 16 bushels per acre. This great difference is worthy of note by our farmers." The prospective sowing this fall will be about equal to that of the last two years, with better preparation of lands, and a largely increased use of fertilizers. The immense demand for breadstuffs for export will certainly hold the prices at their present stand-point, with probably a small advance during the season.

Barley will be sown in larger quantity than usual, say from 10 to 15 per cent. The crop grown in 1878 was the largest we have yet harvested in the State, and will be not less than 600,000 bushels. The crop throughout the United States is above an average about 10 per cent.

Oats and Rye were each 110 in the State, both in yield and acreage. The fall sowing of rye will be equal to that of last year. The yield last year was—oats, 6,838,405 bushels, and of rye, 1,277,278 bushels in the State.

Corn—The yield of this great staple last year was 59,693,146 bushels. The drought in many neighborhoods this year has been so great that the crop will be cut down 20 per cent. below these figures, yet the supply will be ample for home use, and a considerable surplus for export. Prices will be fair, but not excessive either way. Our farmers should plant fewer acres in corn, and fertilize these more highly.

Hemp.—The yield of this year will be 10 per cent. less than that of last year, when 12,752,263 pounds were produced in the State. The dry weather during the past summer, and the want of winter freezes to "mellow the land," caused the stalks to average less in length this season than for some years past, though the fibres are reported to be excellent.

Tobacco.—The conflicting reports concerning the growing crop of this staple still continue from different parts of the State, varying the average yield from 30 up to 80. The month of September has been propitious for the growth of the weed, and several light showers have caused great improvement in the late planting. The early cut tobacco this season is generally inferior. The middle and last cuttings are much better, and exhibit some very fine tobacco. In the "Purchase counties," west of the Tennessee river, the crop will contain many excellent samples, principally among the late cuttings, but the yield will not average above 60. In the Hopkinsville and Clarksville district the early planting is generally small, the middle planting much better, and the latest the best. There will be but little long sightly "African Shipper," but a large proportion of rich, heavy fillers, and "short, fat shippers." The worms have been very bad everywhere in the State, particularly in the Hopkinsville section. The plants set were in this section not more than 75 average, and the yield will be about 66⅔. In the Owensboro and Henderson region there will be a large proportion of the crop of good size and well matured, but the acreage is 25 per cent. below average, and the yield about the same as in the Hopkinsville district. The Hart county sections will produce some very fine tobacco, well matured —average yield 66⅔. The cutting leaf and Maysville districts have a better acreage, relatively, than any part of the State. This section has also suffered less from worms, and have about completed housing a good crop in quality, but only about 80 in quantity. Fully the usual ratio for this season is still unhoused throughout the State, but it will all be secured within the next week or ten days. The entire crop grown in the State in the summer of 1875, was 146,136,796 pounds; in 1876, was 126,808,244 pounds; in 1877, was 191,492,148 pounds; in 1878, it will probably reach not over 115,000,000, judging from the best reports now coming to my office. This will make the yield from 65 to 70 per cent. of an average.

Potatoes have yielded 110, and are of fine quality throughout the State.

Hay and Grasses have done well, when we consider the dry summer; the yield of each is 105. The clover sown last winter and spring has done finely, and the prospects are for a much larger seeding the next season. Our lands demand more extensive clover seeding for fertilizing, as well as for hay and grazing purposes.

Fruit and Orchards.—We have a good year for all kinds of fruit, except apples, which have fallen and rotted more than usual. More orchards were planted last spring than during any one year since the war, and great pains taken to obtain good varieties of trees from our home nurseries. The prospects are promising for a large orchard and vineyard planting the coming winter and spring.

Live Stock.—Throughout the State there is a marked spirit among our farmers to improve live stock of all kinds. This has been particularly the case with hogs, sheep, poultry, and bees. Horses, mules, and cattle remain about the same, with probably a declining taste for high-priced breeders of the fancy pedigrees. The increase in sheep and hogs show that the farmers are paying more attention to these useful animals than they did for several years after the war. The sheep have increased from about 1,000,000 in 1876 to 1,123,956 in 1878, and hogs from 1,142,568 in 1876 to over 1,600,000 in 1878. Poultry has grown to be an article of great value to our farmers. The number of chickens in the State is now 6,381,100, and of other fowls, 2,860,550. If we estimate the value of eggs and poultry used in Kentucky yearly, there is very little difference between the profits of the tobacco and the poultry crop to our farmers. Bees also have become a source of considerable profit. There are now reported to be in the State 157,370 bee colonies or hives in good working order, and the product of honey this year was 4,723,100 pounds.

Annual Report.—In answer to numerous letters asking for my Annual Report for last year, I will say that "Document No. 2," which has been sent to all of the clerks of the county and circuit courts, is a volume of 800 pages, and contains only my report, "Resources and Present Condition of Kentucky." It is sent, with other public documents, to each clerk's office, for the use of the people who wish to read them. In this report will be found a general description of each county in the State, besides much other useful agricultural, statistical, and geological information about Kentucky.

My next Annual Report will be issued in January, 1879, and will be especially devoted to agricultural and statistical subjects.

W. J. DAVIE, *Commissioner.*

AGRICULTURAL AND MECHANICAL COLLEGE.

*AGRICULTURAL AND MECHANICAL COLLEGES, AND THEIR RELATION TO HIGHER EDUCATION.

Not many years after the settlement of the country by the Colonists provision was made, on a scale adequate to their necessities, not only for the common school, but for academic and collegiate training. Long before the Revolution, Harvard College, Yale, the College of New Jersey, and William and Mary's College, Virginia, were known to classical scholars in the Old World as institutions where a high degree of classical culture and mathematical training could be obtained. For the highest reaches of mental training the sons of the wealthy, who had passed through American Colleges, were sent to Oxford, Cambridge, and Edinburgh. Nevertheless, men, not a few of whom America is justly proud, were educated wholly within the Colonies. After the Revolution, academies and colleges multiplied in even greater proportion than the unprecedented increase in population. Knowing well that the liberties of a people can rest only upon a basis of intelligence and morality, the fathers of the Revolution and their descendants determined to lay the corner-stone of the nation which they had created upon the common school, the academy, the college, and the university. By private munificence and public donation the foundation was laid of a system, broad and comprehensive, which should bring the benefits of education to all within the broad domain of the first-born among the nations on the western hemisphere.

Long after the Revolution, the classics, mathematics, and metaphysics exhausted the curriculum of collegiate studies in America. Indeed, the same, with few exceptions, was equally true of the collegiate training of the Old World.

The natural sciences, to which so much time is now given, and which are demanding and requiring an ever-increasing proportion of the time allotted to the training of our youth, were then in their infancy. Departments of research, unknown to our fathers, have touched depths and reached to heights of which they never dreamed. Qualified provision

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*This very able article, upon Agricultural and Mechanical Colleges, and their relation to higher education, has been kindly furnished me by the learned and deep-thinking J. K. Patterson, President of the Agricultural and Mechanical College of Kentucky.

was made for these as they asserted their right to recognition, and though many a hard battle had to be fought before they were allowed citizenship on equal terms with the old denizens, who claimed a prescriptive, and often an exclusive right, yet in the end they made good their plea. Physics, Chemistry, Astronomy, Geology, Botany, Mineralogy, Comparative Anatomy, Physiology, Civil Engineering, and a dozen other natural sciences now enjoy, equally with Classics and Metaphysics, the franchises and immunities of the great colleges and universities of the land.

The practical uses to which many of the natural sciences, especially physics, chemistry, and botany, could be applied, gave them a value other than the merely theoretical and disciplinary value which had hitherto attached to many of the subjects taught in the great institutions of learning. The lad who had passed through a course of elementary physics, or through a course of elementary and organic chemistry, or who had made himself familiar with the laws of vegetable growth, made, other things being equal, a better mechanic and a better agriculturist. Familiarity with the strength of materials, with the mathematical relations which govern the application of the lever, the screw, the pulley, the inclined plane, and the wedge, better enabled him to adjust means to ends, to husband the application of vital force, to design and to execute. A knowledge of the laws of motion, of momentum and resistance, of the conversion of force, of the dissipation of energy, made possible the construction of machinery, and the accomplishment of the vast works of civil and military engineering, which so notably distinguish the present century.

The analysis of rocks and soils, undertaken primarily to satisfy the desire to know the constituent elements of things, taken in connection with the laws of vegetable physiology, was soon discovered to have a much wider application than at first suspected. Soon a distinct science, Agricultural Chemistry was specialized, whose object, as indicated by its title, was the application of the principles of Chemistry to the operations of the farmer and the horticulturist.

The necessity was soon felt for schools whose special character should be to teach the application of the principles of mathematical physics to practical mechanics, and of chemistry and physiological botany to the cultivation of the soil; in other words, the necessity was felt for schools which should turn out intelligent and scientific artisans, intelligent and scientific farmers. To supply this felt want, provision was made almost simultaneously for Polytechnic Schools and Agricultural Colleges in Germany, France, England, Switzerland, Russia, and the United States. In each of these countries, notably in those of the Old World, the rapid growth of population made it necessary to multiply the means of subsistence by increasing the productive power of the existing acreage. The facilities for intercommunication made the creation and employment of skilled labor no less a necessity. How otherwise could the artisans of one country compete successfully in manufacturing industry with those of another? These wants were felt in the United States, whose population has for three quarters of a century been increasing out of all proportion to any known precedent. Vast as is the national domain, the rapid alienation of the public lands made it evident that ere long the time would come when the bulk of this enormous area would be brought into cultivation. Large as is the population, its unparalleled rapidity of growth made it equally evident that the disproportion between population and acreage would go on continually increasing till in the no distant future the United States would be as densely peopled as Belgium or Bengal. The exhaustless fields of coal and iron, and the limitless capacity for cotton and wool, made it evident that the mining and manufacturing industry of America would be on a scale proportioned to the limitless productions of her soil. These considerations, added to the conviction that on a broad basis of liberal culture, morality, and intelligence, the liberties of this people must be conserved, determined the Congress of the United States to make provision, by an appropriation of public lands, for the founding and endowing of Agricultural and Mechanical Colleges in every State in the Union. The intention was not to make them exclusive, accessible only to the influential and the wealthy—to the future mill-owner, the proprietor of mines, and the heir of thousands of ancestral acres—but to make their portals wide enough to admit the thousands of the sons of toil, by whose hard hands and strong heads the future wealth of the country shall be made; to give all who chose to avail themselves of their privileges the opportunity to become skilled artisans and scientific agriculturists; to bring together the experiences in the laboratory of the Mathematician, the Physicist, the Chemist, the Botanist, and the Physiologist; to supplement these by the practical experiences of the farmer and the mechanic, in the field and in the work-shop, and to make all available for moulding and training the future mechanician and agriculturist by whose nerve and brain the future wealth of the country is to be created. In order to do this, a departure from the old university idea was necessary. Classics were not to be excluded, but they were not to be made an essential part of the Agricultural and Mechanical College curriculum. Special prominence was to be given to Mathematical Physics, to Agricultural Chemistry, to Geology in its relation to soils, to Vegetable Physiology, to Comparative Anatomy and Physiology, as determining the laws relating to the breeding of stock. These theoretical studies were to have as their complement, shops wherein mathematical physics should find a practical application, farms and gardens wherein the natural sciences relating to agriculture and horticulture could be applied to plant growth and stock-breeding. Thus the theoretical and the practical would go hand in hand. Thus would science be utilized by its application to labor, and labor dignified by resting upon a scientific basis. Thus would an intelligent, efficient, productive labor be organized, forming the only secure basis upon which self-government can rest.

Scarcely fifteen years have elapsed since the American idea of combining the schools of technology and agriculture, which for the most part were separate in Europe, was put into practical operation. So great a departure from the old system of education was not entered upon without grave misgiving by many who wished well to the experiment. All such enterprises are more or less tentative. But the same may be said of all departures from an established order of things. The turnpike, the railroad, the steamship, the spinning-jenny, the electric telegraph, the reaping machine—all the improvements which distinguish the eighteenth and nineteenth centuries—were at first innovations, experiments which could only claim recognition by demonstrating their success. So with agricultural and mechanical colleges. Their claim to public recognition must, in the end, be their success. While the over-sanguine expectations of some of the projectors of this system, for the technical and scientific training of the masses, may be disappointed, it is equally certain that the confident prediction of failure on the part of its opponents is as certainly exploded. A careful survey of the results strengthen the conviction that this system of education is not only correct in theory, but will yield practical results out of all proportion to expenditure.

But to be successful they must be established, endowed, and conducted in no parsimonious spirit, and on no niggardly scale. All educational institutions, in order to yield results commensurate with the necessities and conditions of the specialties with which they deal, require large expenditures of money. The necessities and conditions of every department of education now-a-days are as far beyond the expenditures of one hundred years ago as are the wealth, population, and political influence of the United States of to-day beyond those of the thirteen Colonies in 1776. A college curriculum comprised, in 1776, Latin, Greek, mathematics, logic, and metaphysics. Open in 1876 the catalogue of any college in the United States worthy of the name, and, in addition to the four or five departments held formerly to be exhaustive for all except those who intended to enter one of the learned professions, an array of sciences then non-existent or in their infancy meets the eye, forming an integral part of its curriculum. No college or university can now pretend to the name in which adequate provision is not made for instruction in these departments of knowledge. There are many schools in this Commonwealth, some of which style themselves colleges, and others, with even more meagre resources and more limited teaching power, style themselves universities. But, measured by this standard, there is neither college nor university in Kentucky.

To found and endow an Agricultural and Mechanical College worthy the reputation, wealth, and resources of the State, will require much more than the pittance yielded by the invested fund derived from the land scrip given to the Commonwealth by the General Government. Not less than fifteen distinct departments of instruction must be provided for, with the requisite laboratories, museums, cabinets, and mechanical and agricultural appliances. It is not necessary that the work-shops should be numerous, or on a large scale; but it is essential that they should be equipped with all that is necessary for illustrating practically the subjects taught in the class-room. Nor is a large farm required. But sufficient ground for illustrating, experimentally, the behavior of crops, under different modes of culture, as modified by the application of agricultural chemistry, seeds, and other conditions. And if, in addition to these, provision can be made for original research, with a view to promote discovery, much will have been done to realize the ideal of a scientific school, whose end is to provide the sons of the Commonwealth with the principles which lie at the basis of intelligent production, and to illustrate these by practical application to the great handicrafts and occupations of life.

While, however, technical and scientific education has become imperative, it is only one aspect of a wider and deeper necessity. The State needs, and greatly needs, a first-class university, adequately endowed, where all her youth can obtain as good an education as can be had anywhere in America or out of it. She requires a university, of which her Agricultural and Mechanical College might form one of the colleges, where not only Classics shall be taught, but Modern Languages, Mining, Engineering, History, Political Economy, Mental and Moral Science, Chemistry, Physics, Mathematics, Astronomy, Geology, Botany, Biology, Comparative Philology, Comparative Anatomy, Mineralogy, Zoölogy, Drawing, in short, the whole circle of science and the whole circle of knowledge. By the concentration of energy and division of labor, the greatest results could thus be obtained with the least expenditure. Such a university ought to be founded, endowed, and controlled by the State, and, by specific legislation, completely isolated from all ecclesiastical interference. Denominational colleges are well enough for a special professional training; but they do not, in these days, rise to the level of the university idea. The time, moreover, is past in this Commonwealth when the highest education needs the fostering care of the church. Educational establishments are, with few exceptions, successful at home and abroad, in proportion as they emancipate themselves from ecclesiastical trammels, and depend upon other means than ecclesiastical endowments for support.

There are other considerations, social and economic, which demand from Kentucky provision for the broadest university training. Three years ago I said in a report, which I had the honor to make to the General Assembly, as Commissioner to the International Congress of Geographical Sciences, held at Paris, France: "There are two types of civilization in this Republic: one is represented by New England, the other is or *was* represented by Virginia. New England gave her impress largely to the States west and northwest of us. The Virginia type prevailed over the States south and southwest. It is needless to inquire which of these is the better. There are some elements in the one confessedly good, which do not exist in the other. As a whole, we prefer the Virginia type. It is equally needless to say that the great civil war gave it a rude shock, a shock from which it may never recover, a shock from which it staggers to-day. Some of its institutions have been swept away. Burdened with debt, crippled in trade, deranged in their economic organization, paralyzed in their industries, the States of the South and Southwest are not likely to recover for years. Virginia has lost her leadership in the South, and the civilization of which Virginia was the representative is to-day in danger of being supplanted by one of a more aggressive type. We ourselves have been unconsciously contributing to this result. Our sons are sent to be educated where the dominant influences are those of New England. The mould in which our early ideas were cast, and the frame-work in which our habits of thought and action were set, are in danger of perishing. It is a struggle for existence, in which we ought not to abdicate our normal functions of co-ordinate thought and activity. Kentucky is to-day, and of right ought to be, best fitted by her origin, her traditions, her history, her geographical position, and by her immense mineral and agricultural resources, to take the leadership, and become the representative of this Virginia type of civilization, now in danger of being obliterated. But in order to do this, it is necessary that she should provide for the higher education within her own borders. She needs a great university which shall be to her what Oxford and Cambridge are to England, Harvard and Yale to New England.

"It is a very common and a very pernicious error, that the Legislature of a State has done its duty in the matter of education, when it has made sufficient provision for common schools. I would not disparage the common school. It has a work to do, and one which cannot be too highly estimated. But in the common school the work of education has only begun. Its subjects are elementary, its discipline preparatory, the faculties which it brings into play subsidiary. At an age when the higher faculties begin to develop, the common school can carry the pupil no farther. The planting has been done, and the rudimentary stage passed. As with the life of a plant, so with that of a human being: its first energy is expended in enlarging its dimensions, with texture feeble and pulpy; then follows a stage when it achieves firmness and consistency, when the fibres toughen and harden, and the prophetic bloom finds fulfillment in the fruit. So far as education is concerned, this is the crisis in human life. All the higher faculties awake. Lines of investigation open out on every hand. The world of mind and the world of matter begin to reveal themselves in new forms and new relations, returning question for question, and put the inquirer to his mettle at every step. This is the time when university training is needed. University training presided over the development of David Hume, Adam Smith, and Sir William Hamilton, and the country which gave them birth would have been amply repaid for all the money expended on her universities for the last three hundred years, had they yielded no other outcome than these three men.

"It is not the masses of the people, however good their common school education may be, which give a nation character abroad. In the end they may contribute to augment and perpetuate its reputation, but the great men of a people determine it. Greece lives to day, and will live through all time in Homer and Thucydides, Plato and Aristotle, Demosthenes and Alexander; and Cicero, Horace, and Virgil form by far, the largest part of our conceptions of Roman majesty and grandeur. England, wide though be her sway and great her power, is known abroad chiefly through representative men like Shakspeare and Milton, Pitt and Wellington; and though the American traveler in the Old World finds few who know anything of Kentucky, he meets with few who have not heard of Clay and Crittenden and Breckinridge." It is not the common school training of the child, but the university training of the man, which fashions the intellect and moulds the intelligence of a people.

APPENDIX.

THE AGRICULTURAL AND MECHANICAL COLLEGE OF KENTUCKY, ESTABLISHED ON THE ASHLAND AND WOODLAND ESTATES.

By the action of the last General Assembly the Agricultural and Mechanical College was detached from its connection with Kentucky University, and placed on an independent basis. It is governed by a board appointed by the Governor. Its course of study has been enlarged by the addition of an advanced course in agricultural chemistry, and by special courses of lectures upon the relation of forests to agriculture, of insects to vegetation, of geology to soils, and upon economic botany.

Good substantial board is provided in clubs at from $1 50 to $2 per week; in private families, at from $3 to $4 50 per week.

Each legislative district in the State is entitled to send three properly prepared students to this College, free of tuition. Other expenses are:

Matriculation fee,	$10 00
Unfurnished room,	5 00
Cost of furnishing room,	$7 00 to 10 00
Club share (for those who board in clubs),	3 00
Fuel and lights,	4 00
Tuition (non-beneficiaries),	12 50

Labor, compensated at the rate of 6 to 8 cents per hour, will be furnished to a limited number of students when such labor can be employed without loss to the institution.

BOARD OF VISITORS OF AGRICULTURAL AND MECHANICAL COLLEGE.

Hon. J. P. Metcalfe, *Chairman*,	Lexington, Ky.
Col. W. C. P. Breckinridge, LL. D., *Secretary*,	Lexington, Ky.
Judge W. B. Hoke,	Louisville, Ky.
Col. L. J. Bradford,	Covington, Ky.
Hugh Moran, Esq.,	Richmond, Ky.
C. A. Hardin, Esq.,	Harrodsbug, Ky.

FACULTY.

J. K. Patterson, Ph. D., *President and Professor of Civil History and Political Economy.*

John Shackleford, jr., A. M., *Professor of English Language and Literature.*

Robert Peter, M. D., *Professor of Chemistry and Experimental Physics.*

J. D. Pickett, A. M., *Professor of Mental and Moral Philosophy and of Modern Languages.*

Jas. G. White, *Professor of Mathematics.*

A. R. Crandall (late of the State Geological Survey), *Professor of Natural History.*

Lieut. R. G. Howell, U. S. A., *Professor of Military Tactics and Civil Engineering.*

Jas. Crawford, *Superintendent of Labor Department.*

E. T. Elgan and N. B. Hays, *Tutors in Mathematics.*

N. J. Weller, *Tutor in Geography and History.*

M. L. Pence, *Tutor in English.*

COURSE OF INSTRUCTION.

History—General Sketch of European History, History of Germany, England, United States, British Constitution, American Constitution, Political Economy.

English—Grammar, Synonyms, Composition, Elements of Criticism, Logic, Rhetoric, English Literature.

Mathematics—Arithmetic, Algebra, Geometry, Trigonometry, Surveying and Navigation, Analytical Geometry, Calculus, Mechanics, Astronomy.

Chemistry—Elementary Chemistry, General Physics, Chemical Physics, Organic Chemistry, Agricultural Chemistry.

Natural History—Physical Geography, Anatomy and Physiology, Botany, Zoölogy, Microscopy, Geology, Palæontology.

Mental and Moral Philosophy—

Modern Languages—French, German, Italian, Spanish.

Military Tactics—Civil Engineering, Military Engineering.

The following official announcement shows the aim and design of the State, in regard to the Agricultural and Mechanical College of Kentucky, and foreshadows the useful career which this institution is destined to fulfill:

"ANNOUNCEMENT BY THE GOVERNOR.

"STATE OF KENTUCKY, EXECUTIVE DEPARTMENT,
"FRANKFORT, August 19, 1878.

"The Agricultural and Mechanical College of Kentucky, having been detached from its connection with the Kentucky University, by act approved March 13th, 1878, and made a distinct institution, free from ecclesiastical control, and governed by a Board of Visitors, who have selected a competent Faculty of seven teachers, will open at Lexington, Kentucky, on the ninth day of September, 1878.

"It is declared by law that the leading object of this College 'is to teach such branches of learning as relate to agriculture and the mechanical arts, including military tactics, without excluding other scientific and classical studies, in order to promote the liberal and practical education of the industrial classes in the pursuits and professions of life,' and the State pays, annually, to sustain it, nine thousand nine hundred dollars, being the interest on the endowment fund.

"Each legislative district in Kentucky is entitled to send to this college, free of tuition, three students, who are required to be selected by a majority of the justices of the peace of each Representative district, and they are entitled not only to the advantages offered by the Agricultural and Mechanical College, but, by arrangement with the authorities of Kentucky University, they have access, free of charge, to the classes of the science and arts of that institution.

"The College will remain on the Ashland and Woodland estates, in the vicinity of Lexington, until removed by the General Assembly, and labor will be furnished to meritorious young men, to aid in defraying necessary expenses.

"Agricultural and Mechanical Colleges, when properly conducted, are of great benefit, and meet a demand that has long existed. This institution may be made to accomplish a great educational work in our Commonwealth, and I earnestly request the people of the various Representative districts to avail themselves freely of the privileges offered, so that not only its present prosperity and usefulness may be secured, but that in the future, wherever it may be permanently located, it may become a blessing and bounty to the industrial classes, and an honor to the Government through whose munificence it was established.

"Further information can be obtained from Hon. J. P. Metcalfe, Chairman of Board of Visitors, or James K. Patterson, President of Agricultural and Mechanical College, Lexington, Kentucky.

"JAMES B. McCREARY, *Governor*."

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*THE THOROUGH-BRED HORSE IN KENTUCKY.

Kentucky has long maintained the first position among the States as the breeder of the thorough-bred horse. To Virginia is the country chiefly indebted for the largest number of imported thorough-bred stallions. Virginia and Maryland were principally settled by men of birth attached to the Cavalier party, who brought their early education and taste to increase the thorough-bred horse, while the settlers in the New England States were, for the most part, attached to the Puritan party, who opposed all amusements.

After Kentucky and Tennessee were admitted as States, they soon took rank as the great breeding and racing points, and may be said to have far outstripped their noble mother, Old Virginia. Kentucky and Tennessee were principally settled by Virginians, and, inheriting the taste of their fathers, engaged in racing and the rearing of the thorough-bred horse. In the earliest publications in Kentucky, in 1787, we find a number of thorough-bred horses standing for public service. This was some years before her admission as a State into the Union.

Perhaps it is well enough, before entering upon the value of the thorough-bred horse of Kentucky, to give the reader some idea of the strains of the thorough-bred or blood horse.

English turf writers have, for convenience, always divided their stock into three strains, which strains originated in the following manner: The first from the Byerly Turk, who was a charger of Captain Byerly in the wars of William III in Ireland, about 1689. Of the lineal descendants of this horse, the most distinguished was King Herod, foaled in 1758, bred by His Royal Highness William, Duke of Cumberland, brother of George II. From the celebrity of King Herod and his stock, it is usual to call the descendants of the Byerly Turk the Herod line of horses.

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* I am indebted for this well-written article upon "The Thorough-bred Horse in Kentucky," to the able and talented writer, Mr. B. G. Bruce, editor of our most excellent paper, "Kentucky Live Stock Record," of Lexington.

In the latter part of Queen Anne's reign, the Darley Arabian was imported into England by Mr. Darley, of Yorkshire. He sold Flying Childers and his full brother, Bartlett Childers, the first of great renown on the turf; the latter was never trained. From the latter, Bartlett Childers, descended that renowned horse, English Eclipse, by Marske, a grandson of Bartlett Childers, out of Spiletta. Eclipse was foaled in 1764, during the eclipse of that year, from which circumstance he took his name. He was bred by the Duke of Cumberland, who bred King Herod, and, on the death of that Prince, was sold to Mr. Wildman, of Smithfield, and afterward he became the property of Mr. O'Kelley, and was frequently called O'Kelley's Eclipse. He had an unexampled career on the turf, having never lost a race. Eclipse was directly descended from the Darley Arabian, and it has been generally accepted to distinguish the line which he adorned as the Eclipse line of horses.

Another horse of foreign lineage, scarcely inferior to the above named, was imported into England and presented to Lord Godolphin, from which he took his name, the Godolphin Arabian. Whether he was an Arabian or a Barb is a point disputed, but his excellence as a stallion is generally admitted. In 1731, then the property of Mr. Coke, he was teaser to Hobgoblin, who, refusing to cover Roxana, she was put to the Arabian, and from that cover produced *Lath*, the first of his get. It is remarkable that there is not a superior horse now on the turf without a cross of the Godolphin Arabian; neither has there been for many years past. From him descended, in a direct line, Matchem, and from the importance of the progeny of Matchem, it has been proposed to term the line to which he belongs the Matchem line. So the reader will see that we have three great strains of the blood horse: first, the Byerly Turk, or Herod line; secondly, the Darley Arabian or Eclipse; thirdly, the Godolphin Arabian or Matchem line. This classification does not hold good at the present day, from the great mixture of blood that has since taken place of these three great lines of stock. We are often amused, even with writers for the turf, who should be posted in such matters, claiming some particular horse to be inbred to Herod, Eclipse, or Matchem. Why, they can not be otherwise, for these are the three branches from which all our racers have sprung. To illustrate the fact, we give the breeding of Imp. Messenger, the most popular blood at the present time for trotters:

IMP. MESSENGER.

SIRE MAMBRINO.

Horse.	Mare descended through her sire from
Darley Arabian	Careless.
Flying Childers	Grey Grantham.
Blaze	Hip.
Sampson	Young Greyhound.
Engineer	Cade.

MAMBRINO

DAM BY TURF.

Horse.	Mare descended through the sire from
Godolphin Arabian	Bald Galloway.
Cade	Partner.
Matchem	Ancaster Starling.
Turf	Regulus.

Turf Mare.

The next point, before going farther, is to define what constitutes a thorough-bred horse. English juries have, time after time, decided that a horse warranted thorough-bred is returnable, if any flaw can be proved in his pedigree—that is to say, if it can be proved that his pedigree is not directly traceable, both on his sire's and dam's side, to an imported Barb or Arab How many generations constitute a thorough-bred horse in England? They have also decided that no number of pure crosses from a common stock can produce a horse warrantable as a thorough-bred. But it is held that five successive crosses of thorough-bred blood so far neutralizes the remaining common strain, as to render the produce nearly a match for any blood; and the proof of this is, that in half-bred (or, as they are usually termed, Cocktail) stakes, horses the produce of the *fifth pure cross* are disqualified. We in America have adopted the same views, and consider a horse of the *fifth pure cross a thorough-bred.*

The first cross is	½
The second cross is	¼
The third cross is	⅛
The fourth cross is	$\frac{1}{16}$
The fifth cross is	$\frac{1}{32}$
The sixth cross is	$\frac{1}{64}$
The seventh cross is	$\frac{1}{128}$
The eighth cross is	$\frac{1}{256}$
The ninth cross is	$\frac{1}{512}$
The tenth cross is	$\frac{1}{1024}$

The superiority of the thorough-bred horse will be found to consist in:

First. They are more intelligent, possessing more brain and nervous matter.

Second. They are, from their intelligence, more kind and tractable in their disposition and temper.

Third. They are less liable to disease, from a superior organization.

Fourth. They are more elegant in carriage and appearance.

Fifth. They are superior in action.

Sixth. They endure the vicissitudes of heat and cold better.

Seventh. They live to a much greater age, maintaining their usefulness.

Eighth. They are superior in fleetness, durability, bravery, and breathing powers.

Ninth. They always have, and always will command, higher prices in market than any other breed of horses.

If you examine the thorough-bred horse, you will, on investigation, find a superior animal organization—his bones are more solid, his tendons stronger and much better defined, his muscles more firm and elastic—in fact, as his form and quality are so much superior, it results that he is much more active, much more fleet, and much more powerful than any other variety of the horse tribe. He will perform much more labor in a given time, and repeat the task oftener, coming around quicker from over-work than any animal of inferior blood. When the common or cold-blooded horse is over worked, his spirit sinks, and his recovery is slow, and sometimes never complete. A square inch of bone from a thorough-bred horse is much heavier than a square inch from a cart horse, the latter being more porous and calcareous, resembling pumice stone, while the thorough-bred is solid, partaking more of the close-grained nature of ivory. The same will apply to the tendons and muscles. Consequently, a thorough-bred horse will be stronger than a cart horse in a little more than half the compass. There is no doubt that the thorough-bred horse can support a greater weight on his back than the common horse.

For all farming or harness purposes the blood horse is in every way superior to the common horse, and more particularly in the South and Southwest, where the heat of the climate makes good wind and endurance an almost indispensable requisite. Experience has convinced all the owners of stage and express lines that it is economy to pay higher prices for horses of some blood than to buy the common horses at even comparatively low figures. The livery and stable-keepers will agree in this opinion, and their experience will confirm it. Take any of our large farms, and we do not fear to hazard the opinion, that if the horses are inspected at the time they usually lay by their crops, itwill be found that the best bred horses are invariably in the best condition, without reference to the size, and that at all times, on a push, they have been able to do the most work. Indeed, the thorough-bred is so superior to any other variety, that the qualities of the horses of any portion of the country will be found to correspond with their breeding, declining in proportion as they recede from the acknowledged thorough-bred. Look in Kentucky, and the breeding and rearing of the thorough-bred marks a line that is easily distinguishable. Central Kentucky, where the blood horse is largely bred, consequently, strongly intermixed with the common horse, has given this section its great reputation and superiority for fine horses. Blood, as the English have found, always tells in the hunting field. When the speed of the hound became so improved as to outstrip the common English hunter, recourse was had to well-bred and three-quarter bred horses, and now fox-hunting in England has become a system of racing under heavy weights, in which nothing but full blood, or something nearly approximating it, can carry the heavy weights across country and the deep-ploughed fields, and maintain a place with the hounds. No inferior bred horse can get through deep, heavy ground, jump hedges and ditches like the full blood, nor finish up and return home so cheerful after a hard day's work. They are rarely ridden or driven off their feed, however severe the exertions of the day may have been, while the common horse will refuse his food, and turn from the manger. If, from English experience, the full blood or thorough-bred horse is so desirable for the hunting field, it must follow that he is equally so for the road or plow. For all the lighter kinds of draught, the thorough-bred is most decidedly preferable; and even for the operations of agriculture, a copious infusion of what is understood by the term blood would be found a great improvement. A class of animals would thus be produced, not so bulky as the ungainly draught horse, but more vigorous and stronger, more active, and capable of enduring much greater and long-continued fatigue.

When a farmer intends to sow any particular crop, he selects the best, for he has found, from long experience, that if his seed is defective, diseased, or of inferior quality, he cannot expect a good crop. It is so in breeding; you must select the best type of animal to breed from, and the blood horse is the highest of his species. It is a law of physiology, and a generally admitted fact by breeders and all authorities upon the subject of breeding, that to improve any blood the sire must be the superior animal; therefore, if the people of Kentucky would improve their horse stock, let them resort to the thorough-bred horse. All, or nearly all, of our breed of horses have sufficient speed, but the difficulty lies in their incapacity to keep up this rate of speed for any length of time. The superior breathing powers of the blood horse is attributable to the thinness and delicacy of the skin, and the unusual number of superficial veins, greater than are to be found in the common horse.

It has been proven, in the great number of experiments performed upon man and the cold-blooded animals, that one of the chief functions of the skin is to decarbonize the blood by separating and throwing off a certain portion of carbon. This is proven by the striking alteration in the color of the blood. The venous blood is dark or purple; the arterial, bright or vermillion. If such is the case in man and the lower animals, we are justified in concluding that corresponding changes are effected by the skin of the horse; and this changes proportionate to the quantity of blood circulating through the vessels of the skin. The veins of the skin, not being subjected to so great pressure as those which take their course between and through the substance of the muscles, the blood will not move with that rapidity toward the heart and lungs when the animal is in violent action. Two advantages result from this: first, the blood is longer detained in the skin to be acted upon and decarbonized; and secondly, the quantity which passess through the heart and lungs in a given time is diminished. If this is true, and there is no doubt of its correctness, it will account for the superior breathing powers and capacity of the thorough-bred horse over the less favored common horse to accomplish a distance of ground. The skin of the race-horse is capable of acting as a kind of reservoir, where large quantities of blood are retained in progress to the heart and lungs, so that a smaller quantity passes through those organs in a given time, but also performs the same function in the lungs in decarbonizing this fluid, and preparing it to circulate over the general system. It follows, as a necessary consequence, that there is not so great necessity for frequent and deep inspirations and corresponding expirations as there is in the common horse, whose skin is so differently constituted.

Taking the ground that the thorough-bred sire is the only present stock from which the other valued kind can be produced with success, it behooves the State to give proper aid, either by prizes or fairs, to encourage the breeding of blood stock. It is ridiculous upon the part of Legislatures to give thousands of dollars annually for the scalps of wild cats and wolves, and when appealed to for aid for a State fair, to advance the agricultural and stock interests of the State, they hesitate and higgle to give the small amount asked. Kentucky should have a State fair connected with, or under the superintendence of, the Commissioner of Agriculture. The great interest of the State is agriculture, and her fine stock forms her chief agricultural revenue.

Kentucky has for years bred more first-class blood horses than all the States combined. The State breeds them in greater numbers, and has a climate, soil, and provender better adapted to the production of the higher types of animals than any section of America. The influence of climate on the animal and vegetable kingdom has not escaped the notice of philosophers; and many learned treatises have been written to show the operation of this cause. Another cause not less powerful in its effects on men, animals, and plants, has been co-operating with climate to modify all living things, which certainly has not attracted proper attention—the geological formations of the different portions of the earth. The attention of geologists and natural philosophers has been confined to the dead and buried, to the age of the earth, to mining, the formation of coal beds, engineering, and the nature of soils in their relations to production. We know of no one who has written in regard to the effects that are produced by geological formations on living things. Perhaps there is yet to come some scientist with the genius, patience, and industry of a Darwin, Tyndall, Huxley, or Spencer, who will explore this new and interesting field, unfolding the secret influence of geological formations hid away in nature's laboratory on living things. If you take Kentucky horses or cattle to Pennsylvania and the Eastern States, their posterity begin to undergo a change in the first generation; in the second, it is still greater; and in the tenth or twelfth remove, they are no longer the same breed of animals. This change is produced by difference in climate and food. But what causes these great changes? The climate is nearly in the same latitude. It must certainly be in the soil, and, consequently, in the vegetation. Animal formation is modified by the vegetable formations of which it is the result! and the vegetable formations are modified by the elements of the soil from which they derive their nourishment. Not only the forms of animals, but their physical systems, their secretions and excretions, are affected by the difference of geological formations from which they derive, through its vegetation, the elements of their organization. It is well known that certain localities, from the nature of the soil, produce better grapes, which impart a peculiar flavor or bouquet to the wine made from them. It is also well known that certain sections of Kentucky produce whiskies of peculiar flavor, aroma, and excellence; that you cannot make them elsewhere in the same perfection without the peculiar water and grain to be found only in these localities. We cannot grow to perfection the peculiar tobacco of Cuba, which furnishes the high-flavored cigars of that beautiful island. You cannot find a locality in which you can grow the tobacco that portions of Connecticut furnish for cigar wrappers. Why is all this, if the soil, and the peculiar constituents that go to form it, have nothing to do in the formation of animal life?

The effect produced on the rose by difference in climate and soil is well known. Its delightful aroma is much less concentrated when it grows in a cold than in a warm climate; its colors are not so vivid, or its texture so delicate. In Florida—the land of roses—the woods are filled with the perfume of—

> "Sweet wild flowers, that hold their quiet talk
> Upon the uncultured green."

We see a marked difference in the influence of soil and climate on the human family. The race of men in Kentucky are larger, as a rule, than those in other States of the Union. The females are larger and more symmetrically formed. We see this in the graceful curve, the swan white neck, the dimpled shoulders and snow white hands, and the moulded form of the women.

Is this not true? Look at the people, horses, cattle, and vegetables. If the nature of the soil and its vegetable productions are not the cause of these remarkable differences of form, texture, aroma, &c., &c., in those grown and raised on it, what is? Why is it that not only certain plants, but certain animals, are never found except in climates indigenous to them, if soils and vegetable products play no part with them?

We know that lime, silex, and phosphates are taken up by the vital organs of plants, giving them size, strength, and firmness. If plants take them up, why should not the vital organs of animals take them from the food raised on such soils?

The dry, rolling lands of Kentucky, with her temperate climate, limestone soil and water, is the best region in America to raise the blood horse and highest grades of stock. The best evidence of the benefit of limestone lands is found in the history of the thorough-bred horse and Short-horn cattle of England. The great stock-producing county of England is Yorkshire, situated on limestone. In our own country we see the difference in men, owing doubtless to climate and soil. The Northerner is cooler, a better calculator, a more dispassionate reasoner than the hot-blooded Southerner, who seems to partake of the heat of his climate. The Northwestern and Southwestern man yields more readily to impulse, and seems in his highest type to be a happy combination between the extremes of North and South.

It seems strange, with all the advantages possessed by Kentucky in soil, climate, grasses, water, &c., that the Legislature of the State does not do more to advance the agricultural interests of the people, especially in the production of fine horses, cattle, and stock in general.

RECAPITULATION OF TABLES OF CROPS, LIVE STOCK, &c., IN KENTUCKY.

These tables were collected from the Auditor's Reports, so far as could be done, from the tables made by the tax assessors of the State. Those not taken from that source have been taken from reports of well posted correspondents in the different counties of Kentucky. As the assessors' reports all begin on the 10th of January of each year, the tables always represent the crops, &c., grown the year previous; for instance, the tobacco crop of 146,136,796 pounds, listed to the year 1876, in the tables, was grown in the summer of 1875, and so of all other crops, stock, &c.

Number of acres of land in the State of Kentucky in the year . . .	1876,	24,054,782
Number of acres of land in cultivation.	1876,	9,942,564
Number of acres of wheat in cultivation	1876,	440,850
	1877,	458,805
	1878,	483,270

Number of bushels of winter wheat produced	1876,	5,038,496
	1877,	5,102,044
	1878,	7,645,604
Number of acres of rye in cultivation	1876,	95,010
	1877,	100,165
	1878,	100,945
Number of bushels of rye produced	1876,	1,137,378
	1877,	1,212,925
	1878,	1,277,278
Number of acres of oats in cultivation	1876,	250,670
	1877,	254,815
	1878,	269,200
Number of bushels of oats produced	1876,	6,654,427
	1877,	6,960,307
	1878,	6,838,405
Number of horses in the State	1876,	377,737
	1877,	380,473
	1878,	380,848
Number of mules and asses in the State	1876,	124,161
	1877,	128,091
	1878,	115,549
Number of milch cows in the State	1876,	95,938
	1877,	98,174
	1878,	100,781
Number of other cattle in the State	1876,	558,755
	1877,	545,495
	1878,	569,123
Number of sheep in the State	1876,	1,021,790
	1877,	1,142,568
	1878,	1,123,956
Number of swine in the State	1876,	1,192,164
	1877,	1,471,008
	1878,	1,645,869
Number of acres of barley in the State	1876,	6,594
	1877,	10,933
	1878,	21,124
Number of bushels of barley produced	1876,	148,004
	1877,	289,067
	1878,	491,238
Number of acres cultivated in buckwheat	1876,	359
	1877,	410
	1878,	519
Number of bushels of buckwheat produced	1876,	5,913
	1877,	8,413
	1878,	9,900
Number of acres cultivated in corn	1876,	2,127,435
	1877,	2,169,756
	1878,	2,201,215

Number of bushels of corn produced	1876,	63,314,116
	1877,	65,668,439
	1878,	59,693,146
Number of acres cultivated in Irish potatoes	1876,	31,370
	1877,	31,995
	1878,	32,585
Number of bushels of Irish potatoes produced	1876,	2,788,876
	1877,	2,979,471
	1878,	3,131,985
Number of acres cultivated in sweet potatoes	1876,	13, [illegible]
	1877,	14,595
	1878,	14,725
Number of bushels of sweet potatoes produced	1876,	926,860
	1877,	987,320
	1878,	1,007,975
Number of acres of sorghum in cultivation	1876,	3,198
	1877,	3,389
	1878,	3,530
Number of gallons produced of sorghum	1876,	518,055
	1877,	543,340
	1878,	557,910
Number of acres of meadow in cultivation	1876,	107,585
	1877,	144,330
	1878,	154,975
Number of tons of hay produced	1876,	122,596
	1877,	178,304
	1878,	173,752
Number of acres of clover in cultivation	1876,	21,575
	1877,	22,665
	1878,	25,655
Number of tons of clover hay produced	1876,	21,200
	1877,	27,095
	1878,	27,040
Number of acres in cultivation of broom corn	1876,	30,265
	1877,	28,060
	1878,	26,010
Number of tons produced of broom corn	1876,	24,850
	1877,	22,820
	1878,	21,185
Number of acres in cultivation of tobacco	1876,	263,117
	1877,	247,986
	1878,	279,025
Number of pounds of tobacco produced	1876,	146,136,796
	1877,	126,809,244
	1878,	191,503,430
Number of acres cultivated in cotton	1876,	2,771
	1877,	2,786
	1878,	1,984

Number of bales of cotton produced	1876,	1,015
	1877,	972
	1878,	791
Number of acres cultivated in flax	1876,	975
	1877,	963
	1878,	1,074
Number of pounds of flax produced	1876,	162,495
	1877,	163,270
	1878,	158,755
Number of acres cultivated in hemp	1876,	21,961
	1877,	18,386
	1878,	19,912
Number of pounds of hemp produced	1876,	14,923,519
	1877,	11,555,193
	1878,	13,752,263
Number of acres in apple orchards	1876,	239,115
	1877,	246,280
	1878,	251,695
Number of bushels of apples produced	1876,	23,503,422
	1877,	23,984,425
	1878,	21,055,674
Number of acres in peach orchards	1876,	65,360
	1877,	67,285
	1878,	71,055
Number of bushels of peaches produced	1876,	8,302,520
	1877,	7,683,575
	1878,	5,948,505
Number of chickens in the State in the summer of	1878,	6,381,100
Number of other fowls in the summer of	1878,	2,860,550
Number of bee stands or colonies in the summer of	1878,	157,370
Number of pounds of honey produced in the summer of	1878,	4,721,100

ANGORA GOATS.

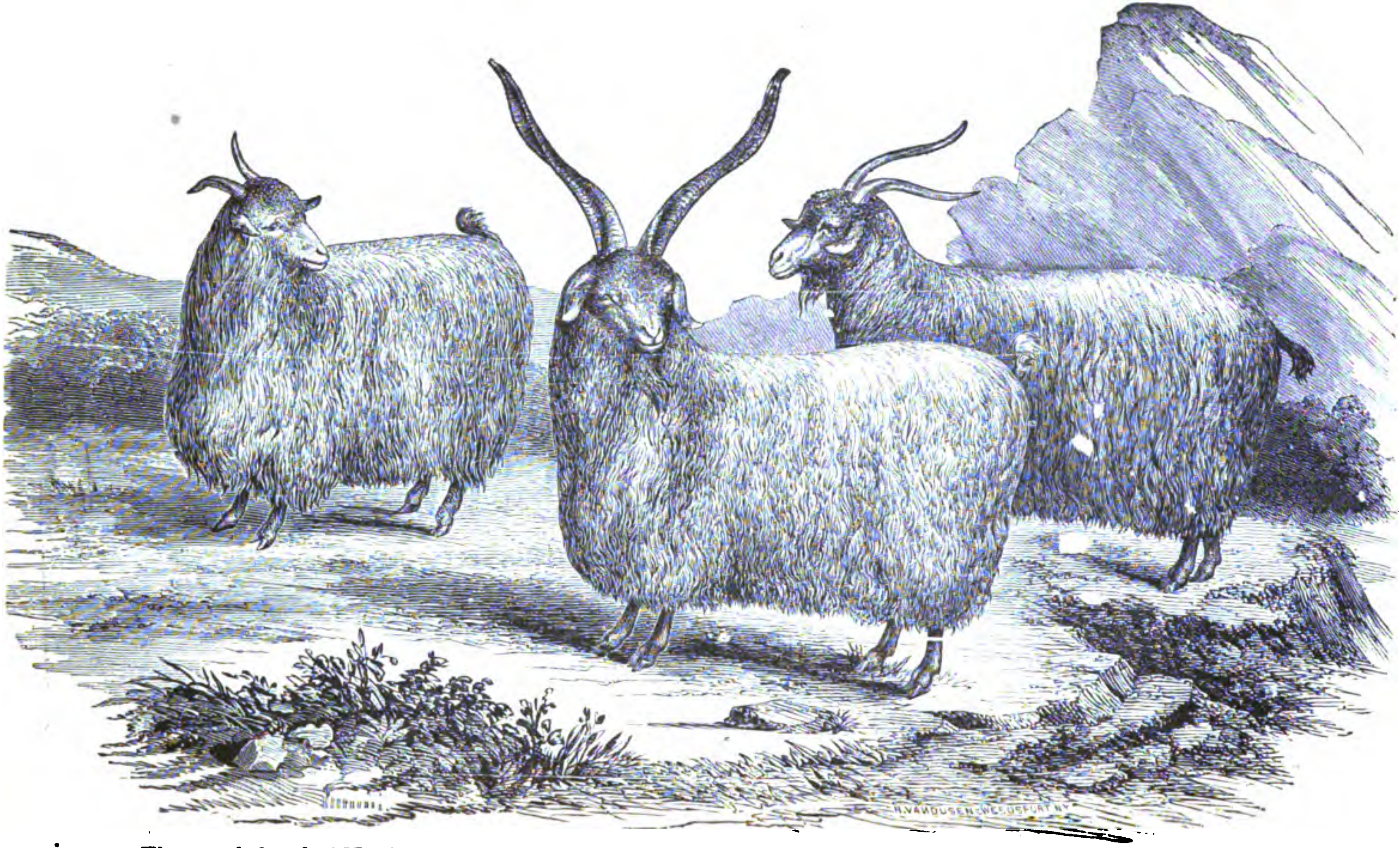
Like the sheep, goats have been the companions of man from time immemorial. The prehistoric races used them for milk, for food, and for raiment. The varieties of this animal are fully as numerous as are those of the horse, the cow, the swine, or the sheep. The most noted, however, for wool or mohair, is the Angora family, which originated in the mountainous countries of Asia. Our people have never given these animals the proper position which their usefulness demands among the live stock on our farms, owing, probably, to the prevailing idea that all goats are destructive to fruit trees and gardens.

Col. Robert W. Scott, of Franklin county, Kentucky, who is one of the best educated and most scientific farmers in the State, and whose farm is near Frankfort, was the first to introduce the Angora goat into the Ohio Valley. He now owns probably the largest and best flock in Kentucky, and has had more experience in their management than any other person. In an article written upon the uses of the Angora goat, and "*How to start a flock, and how to prepare the mohair for market,*" he says:

"The great obstacle to prompt action in the matter is the first cost of a flock, and this obstacle has been greatly overcome by recent reduction in price to one hundred dollars per pair, instead of one hundred dollars each, the former price. The purchaser should then provide himself with about fifty select female common goats, to be bred to the pure buck. These, in small numbers, are scattered all over the country, and once could be had near Memphis, Tennessee, at fifty cents each, and can now be had in Texas and New Mexico at that price. The mohair or fine wool will be thus implanted in the kids of the first crop; but it is not of appreciable value, if shorn, as it will be but little longer than the native hair of the animals, though all hair, even of cattle and hogs, is of some commercial value. The males of this first crop should be castrated when young, and they will make (prejudice removed) as acceptable food as hogs or sheep, and their hams, when salted and dried, can scarcely be distinguished from venison, for which they often pass.

"The pelts of these animals, when grown, will defray all the expense of their raising, and there is steady market for them; many goats being raised, in some countries, for their pelts chiefly.

"By the time the females of the first crop are two years old, they should be bred to a pure Angora buck, which most probably will have been produced by the pure bred female, purchased at first, and this is the reason why it is best to buy such a female at first. The buck at first bought may be again bred to the flock of common females, after which it will be best to sell or exchange him. The mohair of the animals of the second crop will commonly be long enough to be shorn above the ends of the *hair* of the animals, and can be sold for more than enough to defray the expense of shearing, &c. The similar course should be pursued until five crosses have been made, when the animals


H. VANDUSEN, WEEDSPORT N.Y.

Thorough-bred **ANGORA GOATS**, bred by Col. R. W. Scott, of Franklin County, Kentucky. [p. 383.]

are called full blood, the length of the *mohair* increasing with each successive cross, and the *hair* disappearing from their fleeces; though all of the animals, even the thorough-bred, will wear, for two or three months, suits of short coarse *hair*, after their *mohair* has been shed or shorn annually in summer. By the time four or five or more crosses have been made, the animals can scarcely be distinguished from the pure bred, and metal tags in the ears of the pure breds should be used to distinguish them, though close inspection will often disclose some coarse hairs in the fleeces of full bloods. In this matter I do not write from speculation, but from matured experience, having in this manner, several years since, produced a valuable flock, from which, besides frequent small sales, I sold a small flock, chiefly of mixed bloods, for $2,000 cash, and I now have a flock of sixty grown females, in which are a fair proportion of pure breeds, and all are several crosses over full blood. These I am about to breed to a very superior buck, either imported by Mr. Entichydes from Asia Minor, or is directly descended from his imported animals.

"*How to Prepare Mohair, and Where to Sell it.*—As soon as the weather is warm in the spring, the goats will begin to shed their mohair, which may be known by fuzzy appearance over their bodies. No time should be lost; but, as soon as this is perceptible, they should be shorn like sheep, omitting the long coarse hair of the beards and tails, as they are not of much value from small flocks, or, if shorn then, should be packed separately, as also the mane, which some goats have. The fleeces of yearling animals should also be kept separate, as these are the most valuable, and will be more easily graded if the clip is sold according to quality. For this reason, also, each fleece should be tied up separately, *outside out*, with a small, strong, colored thread. All impurities of any sort should have been carefully taken from the fleeces before being shorn; but it is not generally necessary to wash the animals. In the breeding season, the bucks urinate on their beards and on the wool of the forelegs, which accounts for the disagreeable odor, and these animals may require washing. This operation may be easily performed in any pure water, without soap, and without heating the water. After being shorn, the animals may require housing during any very cold nights or cold rains.

"After shearing, the mohair may be packed in bags of convenient size to be handled; and, being carefully marked, may be safely shipped by freight to the East, where it will find a ready and remunerating market at any time of the year. I have thus experienced for many years, and more recently my mohair has been sold on commission by Kitching Brothers, 82 Reade street, New York; at other times, I have sent it directly to the Farr Alpaca Company of Holyoke, Massachusetts, and have always had prompt and fair treatment. There are several other merchants and manufactories who deal in mohair, both in New York and Philadelphia, among the most extensive and reliable of which are Messrs. Justice, Bateman & Co., of 122 Front street, Philadelphia; and I cannot do better, in this connection, than to quote a circular which they have recently published on this subject, as follows:

"'Mohair fleece can be raised in perfection in the United States. We have seen samples from Virginia, Kentucky, and California equal to any grown abroad. At the same time we must candidly say no native clip approaches, even in skillful culture, the product usually found in the Liverpool market. Those who wish to furnish the combing trade, which buys the best material, are advised to follow the directions below: exclude from your flock all animals of less than seven eighths pure blood. Keep the animals young, by killing after taking off the third fleece. The length and luster of the fleece may be increased by crossing with the Van goat. Select bucks for breeding whose locks maintain their full size to the end of the staple; that is, such as are not spiral. The value of fleece is computed from its length, lustre, quality (fineness of fibre), and strength. Keep your flock out of burry pastures. Burs frequently cause a loss of ten cents a pound on the product. Clip but once a year, as early as practicable; after the fleece begins to shed, it loses in value very rapidly. Pack the beard, belly, and tail wool separately, also the coarse locks, brown ends and shorts, and send the clear fleece alone to the comber.'

"These directions are, of course, intended to apply to established flocks, the mohair product being chiefly the object. As I am not familiar with the Van goat, I suppose it is some variety or family of the Angora, which has not yet been introduced into this country from Asia Minor, but which I will be glad to obtain.

"Allow me, in conclusion, to say a word in vindication of the goat, too much abused and shunned on account of his breechy habits. These are to be attributed almost entirely to his keeping the bad company of careless farmers, who keep bad fences, under which he learns bad habits when young. I usually keep them in two or three separate flocks, under fences of all kinds (except my hedges of Osage orange, which they would eat up), and they are kept as securely as any other stock, the stone fences being easily fixed to retain them; and all other stock will sometimes break a fence, but a goat never will."

CLOVER.

This is a genus of plants (*trifolium*) belonging to the natural order of *leguminosæ*, and consists of about sixty known species. The most noted of the *trefoils* are red clover, white clover, lucerne, alfalfa or Chili clover, and a kind of small (rowen) clover, which is indigenous to most soils where white clover abounds. There is an indigenous *trefoil* very much resembling the red clover, which grows wild in the "second bottoms" of the Mississippi river and the adjacent bayous in the southern parts of Arkansas, and in parts of Mississippi and in northern Louisiana, that has never yet been domesticated, and which is frequently mistaken by the citizens for the true red clover. Possibly if this plant was cultivated, it might prove of great importance, both for pasturage and hay, in the cotton-growing States.

The red clover (*trifolium pratense*), of which there are two species (the common and the "sapling"), and the white clover (*trifolium repens*), are the kinds best known in this portion of the United States. They are grown everywhere between the 34th and 41st degrees of north latitude. The following analyses exhibit the food-giving constituents of these two species in the green state:

	Red Clover.	White Clover.
Water	81.01	79.71
Albuminous principles	4.27	3.80
Fatty matter	.69	.89
Starch, gum, sugar, &c.	8.45	8.14
Woody fibre	3.76	5.38
Mineral matter or ash	1.82	2.08
	100.00	100.00

The same, when dried at 212° Fahrenheit, give the following:

	Red Clover.	White Clover.
Albumen of flesh-forming principles	25.55	17.76
Fatty matter	3.67	4.38
Starch, sugar, gum, &c.	44.47	40.04
Woody fibre	19.75	26.53
Mineral matter and ash	9.56	10.29
	100.00	100.00

White clover affords excellent grazing for sheep, cattle, horses, and hogs, before seeding time. After seeding, it has a tendency to salivate horses and mules to a very considerable extent, but is still quite nutritious for cattle, hogs, and sheep. The flowers of white clover are the receptacles of a larger proportion of honey than are the flowers of almost any other plant, and are, consequently, the best sources from whence the honey-bees can draw their supplies of this delicious food. Upon the soils of the Upper and Lower Silurian formations, white clover is a valuable forerunner of herds-grass, orchard-grass, or blue-grass. If sown with blue-grass on woodland lots, it immediately takes possession, and keeps off all other grasses and weeds, until the *catch* of blue-grass becomes perfect, when it yields to the greater tenacity of the latter. Being very hardy, it withstands dry weather and hard grazing better than any of the *trefoil* family of plants.

Red clover, though not, strictly speaking, one of the grasses (*graminæ*), is, nevertheless, the *sheet anchor* of the planters in many sections of our country for farm use, as a grazing crop, as a hay crop, and as a cheap perfect fertilizer. It grows well upon almost any kind of land of moderate fertility, but is peculiarly well adapted for calcareous soils, underlaid by stiff red clays. The plant feeds mainly from the atmosphere, and returns, by its tap root (which penetrates from six inches to six feet into the earth), a large amount of plant food to the soil. As a green crop, turned under by the plow, red and sapling clover have no superior as fertilizers (unless it is the cow pea), and if they are once well seeded upon good land, and then properly managed in a system of rotation cropping, they will never run out or need re-seeding, for the seed ploughed under deeply will remain in the ground for several years, and germinate when again turned to the surface. Red clover, as a grazing crop, ranks equal, if not superior, to any of our domestic grasses. The nectarines of the bloom are rich in honey, upon which the bumble-bees feed, but which cannot be reached to any considerable extent by the short proboscis of the honey-bee. This saccharine property is preserved in the hay, when the clover is cut while in full bloom, and causes well-cured clover hay to be one of the richest kinds of provender that can be fed to cattle, horses, or mules. When timothy is mixed with clover, the hay is greatly improved and more easily cured. Salt sprinkled over the new mown clover hay, when it is put into the stack or barn, adds greatly to its nutritious qualities, and makes it far more palatable to all kinds of stock. If clover for hay is allowed to become very ripe without cutting, the starch and sugar of the plant will change to woody fibres, and thus cause it to become too hard and brittle, and thereby greatly lessen its value. Clover being much more succulent than the grasses, requires more time to part with its moisture, and should therefore never be cut when wet with either dew or rain. It should not be dried by the heat of the sun, so as to become scalded in the swath, as this causes the hay to be dark, and to lose its flavor and aroma.

In 1000 parts of well dried *red clover* hay there will be found 75 parts of mineral constituents, as follows:

Lime	37.1	Chlorine	4.8
Potash	26.7	Silica	4.8
Soda	7.1	Magnesia	4.0
Phosphoric acid	8.8	Iron (peroxide)	0.2
Sulphuric acid	6.0	Manganese	a trace.

From numerous experiments, we find that clover is a great feeder from the atmosphere, receiving from it large proportions of potash, soda, phosphorus, and sulphur. These are minerals essential to the growth of all staple crops; the power which this plant has of drawing them from the atmosphere, and carrying them through its long roots *into the soil*, is the cause of its great superiority as a fertilizer upon worn or exhausted lands. No other plant possesses this power in a greater degree. Consequently, it will pay a farmer well always to have this for one of his rotation crops; and as red clover is a biennial plant, having perennial qualities, it should usually be allowed in the rotation not less than two years, in order to reap from it the greatest benefits.

Green crops of clover ploughed in (as before stated) with large ploughs, tend to enrich lands very rapidly. When this is done, in order to get the best results, old pork-house salt should be sown over the land before the plough. The action of the salt fixes the gases, and prevents the land from becoming soured by the fermentation of the green plants. Lands become "*clover sick*" only in the absence of a proper system of crop rotation. German kainit, gypsum, and bone-dust, in equal parts, form a most excellent compound fertilizer for clover, and it may be sown broadcast over the crop at any season of the year.

If lands are too thin or worn for clover to get a good *catch* or stand, it is best to sow them early in the spring with the cow peas, and turn this under in the green state, when at full bloom, or when partially seeding, and then sow in September in rye, and with clover in February or March, taking care to harrow the land well immediately after sowing the clover seed.

The best time to sow clover seed is in March or April, on wheat, rye, or oats, and it is *always* best to harrow it in when sown on either winter rye or wheat. Ordinarily, one gallon of seed to the acre is sufficient; but when the object is to grow the plant for the purpose of saving the seed, or when the clover is sown by itself on corn land, it is better to sow one third more to the acre. The *first crop*, or spring growth of clover, produces very few seed, wherefore it is better, if seed-saving is the object, to cut off or graze off the spring crop when in full bloom, and then let a second crop come forward, which will have ample time, in this latitude, to mature the seed before frost. It is more profitable to raise clover seed for market than it is to produce wheat for sale; and it is astonishing that so few Kentucky and Tennessee farmers have found this out, although their lands and climate are admirably adapted for this industry. The "*clover hullers*" are now made so perfect, that the seed can be as easily cleaned as can either oats, rye, or wheat; almost any good land will produce from four to eight bushels of seed to the acre.

In many cases, where the crop of hay is very heavy, it is well to mix in the stack either straw or other fodder or grass hay, even to the extent of twenty to thirty per cent., as each are thereby greatly improved, and will be much more palatable for winter food. As a "*soiling crop*" for cattle or other stock, clover is invaluable, though care must be taken not to feed it too lavishly at first, for fear of injury to the stock from their over-eating, which may prove fatal. This is particularly the case with the sapling variety, that grows much more luxuriantly and coarser than common red clover.

While the clover plant is very hardy, yet it is easily killed, either by frost or dry hot weather when in the *sprouting state*, or before it has fairly taken root. This shows the necessity of sowing the seed upon land recently ploughed, or else of having the land well harrowed, if the seed are sown on wheat or rye fields, where the soil has become hard and compact from the effects of winter rains. The practice of sowing clover on snow has two good reasons to recommend it: first, regularity, and second, the chances that the seed have of becoming covered with a small amount of dirt by lodging in the cracks made in the soil by the absorption of the melting snow into the earth, or by the subsequent freezes and thaws; but this is nothing like so reliable for a successful *catch* as a good harrow, used when the ground is in proper order.

When we sum up the many advantages of clover to the farmer, based upon the universal experience of the best and most scientific planters in

Kentucky and Tennessee, we must rate them higher than those of any grass crop known, not even excepting the famous Kentucky blue-grass. This is particularly the case, if we consider the fact that clover feeds so extensively from the atmosphere, and that it can be made to flourish upon all sorts of land, and upon every geological formation—an essential quality that belongs to none of the known grasses or plants used for hay or grazing. This adds greatly to its value, and will always cause it to be the *sheet anchor* to our farmers as *the grazing*, *hay-making*, and *fertilizing plant* of our country.

The various grasses possess different qualities that highly recommend them for particular uses; but clover alone demands, by its intrinsic merits, a prominent position upon every farm, and the planter who disregards this claim will find that he has much to learn, numerous experiments to make, before he can substitute anything which can so greatly aid him in enriching his lands and feeding his stock as the simple *clover plant.*

[Written for Western Farmers' Almanac.]

AGRICULTURAL CHEMISTRY.

By Prof. Robert Peter, Kentucky.

All Vegetable Bodies are Made Up of Cells.—Nothing in the whole economy of nature is more wonderful than vegetable life and growth. The most skillful observer with the microscope, with the aid of the most finished instruments and of all the appliances of modern science, can discover nothing in the ultimate structure of plants of all kinds but a congeries of small *cells*, of which all their parts are formed; as well the original germ of the seed or the nutrient seed-lobes which supply its earliest food, as all the multiform parts and organs which make up the mature individual plant or tree.

Without exception, all parts of all vegetable growth are primarily formed of cells; and when we search for the seat of the life of plants, or for that wonderful governing force which determines the character, form, size, and varied properties of all the numerous individuals of the vegetable world, we are necessarily obliged to look to the cells for a solution of the problem.

What is the Location of the Vital Force of Plants.—It is easy for the microscopist to determine the form and size of the cells, and to watch nature in her curious processes of multiplying them and building them up into all the forms of roots, stems, leaves, flowers, and seeds, with their infinite varieties of shapes, colors, and properties distinctive of the several plants; but his most patient and skillful observation has shown him nothing beyond a peculiar sac, the cell, filled with a transparent liquid, the sap, containing a small nucleus, or also a smaller rounded granule called a nucleolus, and lined with a yellowish, turbid, mucilaginous, semi-fluid substance, containing small granules, which is the much-famed *protoplasm* or the *formative layer* of the cell.

So is it in all vegetables, of whatever class or species; and the most skilled observer is foiled, as is ever the case in searches for ultimate causes, in his endeavor to find out where the life and wonderful directive forces of the plant reside which preside over its growth and development, and give to each individual, as also to every part of each, its peculiar form and properties. Equally futile are the skilled labors of the chemists of the world. They can determine the various elementary substances which unite to produce the peculiar substance, *cellulose*, which forms the cell-walls of plants, and show that the so-called *protoplasm*, more complex in its nature, resembles animal bodies in its composition. They can demonstrate that the elements which form the substance of the cell-wall and its contents, as well as all the several products of vegetable growth, are derived from the air, the water, and the soil; but the *mysterious force* by which the plant grows and is developed, which is present in the living germ but absent in the dead seed, though the visible structure and the chemical composition are sensibly unchanged, escapes alike the most labored analyses of the chemist and the searching scrutiny of the microscopist.

The Protoplasm Theory.—The *theorist* comes in, as usual, where definite knowledge is wanting, and claims for *protoplasm* the seat of the living principle or force of the plant. And his theory has the support of the observed fact, that certain microscopic specks of mucilaginous semi-fluid, or of protoplasm, to be found floating in water, possess the general properties of animal life, although without form or structure. But this fact, wonderful as it is, no more solves the question of the seat and origin of the vital forces of vegetables than did the other well-known discovery, made a long time ago, that they depend upon the solar light and heat for their growth and development.

The Wonders of the Vegetable Cell.—Let us consider a single vegetable cell, with its cellulose walls, its minute nucleus and nucleoli, its sap-water, and its albuminous protoplasm. Let us suppose it has been taken from the living germ of a seed, and that the species of vegetable which produced the seed is unknown to us. The microscopist who might study it with most perfect skill and appliances would utterly fail to discover what manner of plant would be produced by its propagation and development. The chemist would equally be unable to show the remotest difference in composition to enable him to say whether it belonged to the germ of an oak or whether it might aid in the development of a cabbage.

When we consider the wonderful occult capabilities of vegetable cells, we are lost in admiration of the mysteries of nature. With apparently a nearly similar simple structure and a chemical composition always the same in each, the germs of the many thousand vegetable beings which inhabit our globe have contained within the circumferences of their microscopic cells laws impressed, unchangeable in their nature and plans and capabilities of structural development most beautiful, varied, and distinctive. Well may we ask the speculative (so-called) philosopher, what power within the narrow vegetable cell of the germ enacts the law that this speck of protoplasm shall develop only into a rose-bush, while that similar microscopic molecule of nitrogenous semi-fluid in another similar cell shall help to build up only a wheat-plant? This is not all. Where within the limits of the germ of the seed can we find that complicated scheme or structural plan which gives to each adult vegetable form its own peculiarities, determines the size of the plant, of the leaf, the flower, or the seed; the color and form of the flower, the arrangement of the veins of the leaves? The form and properties of these organs, even the shape of the curvatures on their edges and the character of the down or hairs and glands upon their surfaces, are all predetermined by laws laid upon the minute soft cells of which the germs of the seeds of plants are made up, obliging each to develop and produce, *according to its kind*, plants which vary infinitely from each other, each of which shows in its structure, form, size, and most minute peculiarities, constant and distinctive characters.

The External Agents of Plant Growth.—Wonderful as are the capabilities of vegetable cells, they are wholly dependent on external agents for their increase and development. Vegetable germs can develop and grow only by the formation of new cells out of materials supplied by the air, water, and the soil; and they can appropriate these materials to supply their growth only with the aid of the heat and light of the sun.

It is now well known that the greater weight of all vegetable bodies is derived from the *atmosphere*. This gives to the growing plant the carbon, hydrogen, oxygen, and nitrogen, which are their principal elementary constituents. But no growing vegetable is made up of these elements alone; even the cells of the growing plant require for their formation other elements, which can be derived only from the ingredients of the soil, and which are introduced into the cells only in watery solution. These are principally compounds of phosphorus, sulphur, chlorine, potash; soda, lime, magnesia, iron, manganese, some other ingredients in minute quantities, and silica in notable amount.

The Philosophy of Stirring the Soil.—Fortunately for us, the atmosphere, which is so essential to plant growth, pervades all space on the earth's surface. The cultivator, however, has found out by experience the beneficial influence of stirring and lightening up the soil, within certain limits, in facilitating the access and absorption of the gases and vapors of the atmosphere, thus favoring the growth of his crops. The thrifty farmer or gardener who keeps his soil around his growing crops in a light, porous condition, as compared with the slovenly cultivator who allows a hard, impervious crust to remain around the roots of the young plants, demonstrates in his greater products the intimate dependence of growing vegetables upon the atmosphere.

The Utility of Underdraining.—Water, equally indispensable to the growing vegetable, is less regularly present in due quantity. Too much of this important article of plant-food is equally as injurious as too little. The cultivator removes the excess by the use of drains and supplies the deficiency by irrigation; each equally important and valuable. The farmers of the older countries have fully demonstrated the great utility of *underdraining* the soil, even where the fields are not naturally too wet, as they find that not only do the open drains, when properly laid down, quickly carry off any excess of water which may fall upon the fields, but that they cause a continued circulation of air through the soil whenever the soil is colder than the atmosphere—which is the case in spring and summer—and that this regular flow of air through the earth tends to warm up the surface quickly in the spring of the year, and introduces gases and vapors, while it mitigates droughts by introducing water in the form of vapor, which condenses abundantly in the pores of the colder soil, and thus supplies the wants of the growing crops. The farmers of this region could doubtless often profit by following their example.

Irrigation.—Irrigation has not been deemed so important in the favored region of Kentucky as to cause much expenditure on the part of our cultivators to provide for it, as a regular thing, by machinery, or water-reservoirs, sluices, etc., although droughts frequently occur in the warmer months of the year which do immense injury to growing crops. Improvements in wind-mills are quite promising in this direction, and many of our enterprising farmers may be induced to calculate, as our markets for farm produce enlarge, the relative expense and profit of a system of regular irrigation of at least a portion of their farms.

Mineral Fertilizers.—Air, water, light, and heat, all in due proportions, would not cause the development of a single vegetable cell without the assistance of the mineral ingredients generally found in the soil.

Especially are the phosphates and the alkali, potash, deserving the attention of the cultivator in this relation; the other mineral ingredients, such as lime, magnesia, oxides of iron, and manganese, etc., being generally present in superabundance in almost all soils. Potash is essentially useful in favoring the green growth of plants, and the phosphates are especially indispensable to the formation of the seeds. Both these fertilizers generally exist in the soil in but limited proportions, and both are habitually carried off in crops—the potash especially in green crops, the phosphates in greater quantity in the grain crops. Consequently, experience has shown the necessity of resupplying these to the soil which is to be maintained in a constantly productive condition under continued cropping. One great question in the application of these fertilizers is, how to obtain them in their cheapest form in a soluble condition.

Nitrogenous Manures.—But these alone, without the use of some nitrogenous compound, are found to be of but little service. This remark applies especially to the phosphates. In the vegetable product phosphates are always associated with nitrogenous matters, which constitute the nutritive or flesh-forming ingredient of food; and it is believed that nitrogenous vegetable products cannot be produced without the aid of phosphates.

Bone-dust, bone superphosphate, guano, etc., contain both the phosphates and the nitrogenous compound, and superphosphate made from mineral phosphate of lime is usually mixed either with some ammonia salt, some refuse animal matter, some nitrate of soda or potash, or other nitrogenous material, to make it effective as a fertilizer.

Plant-food Must be in a Soluble or Dissolved Condition.—All the necessary mineral fertilizing ingredients may be present in a soil, and yet may be of no avail unless they are in a soluble condition, and unless they have also a solvent. A surface made up of coarse pebbles only, without any pulverized material, would be hopelessly sterile, even though those pebbles might have the chemical composition of the best fertilizers. The mass of coarse pebbles would lack the porosity and solubility of a good soil. Fertile soils must possess both. But fields of fine, light, and porous soil, of the most favorable composition, would be wholly unproductive in a drought for want of a proper solvent to convey the mineral ingredients into the tissue of plants. Even when water enough was present, if the fertilizing elements of the soil were in such a condition that it could not dissolve them, the soil would be perfectly sterile. Hence the great utility of solvents and decomposing agents.

Atmospheric Water the Natural Solvent.—Nature's great solvent is the atmospheric water, containing, as it does, carbonic acid, which not only takes up what is already in a soluble condition, but by means of the dissolved acid decomposes the silicates of the soil and sets free potash, phosphates, etc., and is enabled also to hold lime, magnesia, and the phosphates in solution.

The Value of Humus.—Another most important solvent is *humus*, or the remains of animal and vegetable decomposition, which gives the dark color to the rich surface soil, and makes the difference between a garden-mold and a subsoil. This vegetable matter acts like the carbonic acid in decomposing and aiding water to dissolve the valuable mineral elements of the soil while it also exceeds most other bodies in its power of absorbing gases and vapors from the atmosphere. Cultivators should therefore favor the production of humus in their soils by the application of barnyard manures, decaying vegetable and animal matters of all kinds from the compost pile, or by ploughing in growing clover or other green crops, taking care not to reduce its proportion too much by too long cultivation at any time in hoed or ploughed crops, which tend rapidly to remove it.

[From the Illinois Agricultural Report.]

FARM DRAINAGE.

By H. W. S. Cleveland, Landscape Gardener, Chicago.

In a report, made nearly thirty years ago, to the State Agricultural Society of New York, by a committee appointed expressly to consider the question of drainage, I find the following paragraph:

"There is not one farm out of every seventy-five in this State but needs draining—aye, *much* draining, to bring it into high cultivation—nay, we venture to say that every wheat field would produce a larger and finer crop if properly drained."

No agriculturist who is familiar with the topography, soil, and present condition of culture of Illinois, as compared with New York when the above was written, will feel any hesitation in asserting that the above verdict is more emphatically true of the former State to-day than it was of New York at the time it was rendered.

The great agricultural necessity of our State is a thorough system of underdrainage, not alone of the swamps and sloughs, which occupy so large a portion of her territory, but of the higher prairie lands, which comprise the great harvest fields of the State. Comparatively speaking, there is scarcely an acre of these lands whose productive powers might not be very greatly increased by a judicious system of tile drainage.

Up to the present time it may be said, almost literally, that no attempt at drainage has been made, except of the sloughs, which are found of greater or less extent on every prairie farm. The character of these are too well known to require description. They often occupy a very large portion of the farmer's possessions, and are always an eye-sore, and a source of annoyance, expense, and ill-health, yet they contain the richest soil of the whole farm, composed of the surface washings of the adjacent higher lands, and the decomposed vegetable matter which annually grows in rank luxuriance, and adds its decaying elements to the previous store of fertilizing material. The profit to be derived from the drainage of these sloughs is so obvious and direct, that the only wonder is that they are ever suffered to remain, when they might so easily be converted into the most productive portion of the farm; yet it is only occasionally that their redemption has been thus secured, and on the great majority of farms throughout the State they still disfigure the land, intersecting the arable fields with an irregular and unsightly area of worthless marsh. It is to these tracts, thus far, that drainage has been almost exclusively applied, and the process for the most part has been of the simplest kind, consisting of a main drain of five or six inches diameter carried up from the outlet, and following the course of the centre of the slough through all its meanderings, with occasional side-drains where its width seemed to render them necessary, or where an opportunity occurred to connect with smaller sloughs on higher land. In all cases where such tracts as these have been drained, the result has been their immediate conversion into dry, firm soil of luxuriant fertility, susceptible of cultivation as early in the season as the higher lands, and greatly exceeding them in productive power. That such should be the case is so evident a proposition, and has been so often demonstrated in practice, that no man of ordinary intelligence would presume at this day to deny its truth, and this work of draining the sloughs should be, in all cases, the first step in a system of thorough underdrainage; for the main drains, into which the others must be led, will, of course occupy the lowest lines, and follow the course of the sloughs from the outlet to the head. It is, therefore, a matter of vital importance to determine, at the outset, the relative heights of the different points in the course of the main drain, to secure, first, a regular descent sufficient to insure a constant outflow; and, secondly, to keep it so much lower than any of the fields which may ever have to be drained into it, that no portion of any such side-drain need be less than three feet below the surface. A moment's reflection will enable any one to perceive that a careful attention to this matter, before beginning the work, may save a very large outlay of money and labor at a later period.

Farmers not unfrequently assert that they cannot drain their lands for want of sufficient fall; and in so level a country as prevails generally in Illinois, it is not surprising that this apprehension should be common. But it should not be admitted without careful investigation. Very few men are competent to judge, without careful measurement, of the relative height of different portions, even of an area which can be scanned at a glance; and no man can tell by the eye whether the descent is sufficient for purposes of drainage on what is seemingly a level area of considerable extent. Inexperienced persons are always surprised to find how slight a fall is absolutely necessary for a sufficient outflow, provided the descent is of even grade, and the tiles laid with such care as to offer the least possible friction or obstruction to the current. It is always desirable to preserve as even a grade as possible throughout the line of descent, yet it is often a difficult rule to follow. Where the fall is very slight, however, it is absolutely essential to success that no such obstruction as even a continued level space should be encountered. With straight lines, even grade, and smooth tile, a fall of two and a half inches in a hundred feet will suffice for perfect drainage. No man can perceive with the eye alone so slight a variation from a level as this, neither would it manifest itself by the flow of surface water through the usual obstructions of swamp vegetation. In all cases of doubt, therefore, and in many cases where the proprietor is satisfied that his case is hopeless, the application of a leveling instrument may reveal possibilities of relief not previously suspected. The lowest point at which an outlet can be secured having been determined, it will be easy to ascertain what degree of fall can be secured, and also the minimum depth at which the main must be laid, to allow sufficient fall from the remotest point of any of the side-drains.

Having thus glanced at the subject of swamp or slough drainage, the necessity of which, on the score of profit or health, it is to be presumed no one will deny, I come next to what I conceive to be a more important subject of discussion, because its necessity is less obvious, and its expediency is still doubted by many intelligent farmers who have not had an opportunity to witness its effects—I mean the drainage of the higher lands, the surface of which is not overflowed, and is only occasionally and temporarily too wet for cultivation. Such are the uplands of the prairie farms, which constitute the arable lands now under cultivation throughout the State. Rich as these lands undoubtedly are, their productive power is susceptible of enormous increase, while the uncertainty arising from unpropitious seasons might be permanently averted by thorough and systematic underdrainage.

The necessity of drainage is not to be determined by the quantity of water which falls or flows upon the surface, nor upon the power of the sun to carry it off by evaporation; but upon the character of the subsoil. If that is of sand or gravel, the water will pass off below by natural drainage; but if the subsoil is clay or other impervious substance, the water is checked in its downward course, and remains stagnant or bursts out upon the surface in the form of springs. Most of the prairie lands are of the latter character, and wherever such subsoil exists the land will not only be improved by tile drainage, but it may be said that such drainage is absolutely essential to its proper development and culture. To question the necessity of the process is little less absurd than it would be to ask whether it would be improved by ploughing, instead of making hills for corn in the prairie grass with a hoe or spade. All lands require drainage which, *at any season*, contain too much water—that is, which hold at any time of the year more moisture than is good for the crops, and causes them to suffer, either by freezing out in winter, or having their roots in water during the growing season. Drainage has been appropriately defined as "the art of rendering land not only so free from moisture that no superfluous water shall remain in it, but that no water shall remain long enough to injure or retard the healthy growth of such plants as are required for the sustenance of man or beast." There are some plants, as rice and cranberries, which require a wet soil, but most of those which are useful to man are drowned by being overflowed for a short time, and are injured by any stagnant water about their roots.

The soil of the prairies, in most cases, is underlaid with clay, which not unfrequently contains a mixture of metallic oxides, which causes it to form a substratum almost of the nature of rock, and known commonly among farmers as "hard pan" It is a common impression that clay is impervious to water, and that, therefore, a clay soil—and particularly if it has assumed the solid form of "hard pan" under the surface—cannot be drained with tile, and especially if the tile is laid lower than the "hard pan." But that such land is not absolutely impervious is proved by the fact that it is very wet in the spring at almost any depth, while in the latter part of the summer it becomes dry and hard. How comes it to be soaked at any time, if water does not go into it? And how comes it dry, if water does not come out of it?

The facts that clay will readily absorb a great deal of water, and that it may be subsequently dried, proves conclusively that it is not impervious to water, but they do not prove that water will pass through it with sufficient rapidity to answer the practical purposes of drainage. It is, nevertheless, a fact, that owners of clay farms almost invariably overestimate the difficulty of draining their land. They know that puddled clay is used for the bottom of ponds, canals, etc., and is nearly or quite impervious. But such is not its natural condition, and it is only reached by working and beating it while wet, or, as in the case of the hard pan subsoil, by continued pressure from above. Nor can clay be kept in this condition except by being constantly wet. If once dried, or subjected to the action of frost, it resumes its natural porous condition.

If, in laying drain tiles in a clay soil, the clay which is taken out of the ditches is replaced after the tiles are laid, while it is still wet, the effect will be the same as if it were puddled, and the water will stand on the surface directly over the drains. A single inch of such clay will prevent the water from passing through as effectually as any greater thickness. But if it is dried before being replaced it will lose this quality, and will never afterwards acquire it again, because it will be continually subjected to a process of alternate wetting and drying, instead of being constantly soaked with standing water. In the same way, whenever drains are introduced in a field of which the subsoil is a stiff clay, the water begins to pass off, and the soil and subsoil necessarily begin to contract, and as they shrink they crack, and thus afford more easy passage for the water. With every change from wet to dry, the facility is promoted. If subsoil ploughing is also practiced, it will greatly promote the process of drainage, and, in fact, it should always be considered a necessary accompaniment of the laying of drain tiles in such a soil.

The opinion is often expressed by farmers that it will not do to lay the drains at a greater depth than the hard subsoil at which the water commonly stands. This is very often not more than two feet below the surface, and the theory is, that, being impervious, the drains can only attract and carry off the water which stands above the surface of the hard pan. Experience, however, has proved that by laying the tiles at a greater depth, the water will find its way to them—perhaps slowly at first, unless aided by subsoil ploughing, but with increasing celerity from year to year, till the whole mass, to the depth at which the drains are laid, had become permeable. There can be no more mistaken and foolish economy, therefore, than shallow draining, which, in fact, is simply the abandonment of the chief advantages which can accrue to the soil from the practice. No person, whose experience has been sufficient to give weight to his opinion, will admit that a less depth than three feet is worthy of consideration in any case, and in clay soils, or loams having a clay subsoil, the advantages of a greater depth are so obvious and important, that it may be said—speaking comparatively—that no man can afford to lay his tiles at a less depth than four feet. However stiff a clay may underlie the top soil, its character would be effectually and permanently changed in a few years by a system of drains not less than four feet deep, and not more than forty feet apart, and the improvement would be greatly accelerated if subsoil ploughing were also made use of.

From data received from a great many sources, I feel no hesitation in expressing my belief that the crops of Illinois might be doubled by a judicious and thorough system of underdrainage. A vast extent of fertile land might thus be created where now are only sloughs and swamps, productive only of disease, and there is scarcely an acre of the higher prairie lands which would not be sufficiently benefited by the process to warrant the investment. The only exceptions are the comparatively few cases in which the prairie soil is underlaid with gravel.

In considering the subject, it is important to bear in mind that the improvement is not only a permanent one, the beneficial effects of which are to endure for all time, but that years must elapse before the full development of its action on a clay soil will be attained. In soils that have been properly drained, the injurious effects of wet or dry seasons are comparatively unknown. Water is never held in sufficient quantities or for such length of time in the soil as to prove seriously destructive; and, on the other hand, such soils never become parched or baked to such extent as to check materially the growth of crops.

The mechanical effects of drainage are to deepen the soil and promote its more thorough pulverization. Its first effect is to dry its surface soil by drawing out of it all the surplus moisture, so that in early spring or late autumn it may be worked with the plow as advantageously as at midsummer. A wet soil can never be properly pulverized, and the ploughing or working a clay soil, or even a heavy loam, when wet, tends only to puddle it, and render it less pervious to water and air. Rain water contains a great quantity and variety of fertilizing substances, and it deposits them in the soil during its passage through it. Both these facts are perceptible to the senses without resorting to chemical tests. If we consider the inconceivable amount and variety of impurities which are continually arising from the surface of the earth in the form of gases, created by the decomposition of animal and vegetable matter, we can easily understand that the air must be heavily charged with them. They would indeed very soon suffice for the destruction of animal life, but for the provision for their withdrawal from the atmosphere and restoration to the soil by the falling rain. The air is pure and sweet after a shower, because the rain has absorbed and carried off the offensive matter with which it was charged, and the rain water is nauseous and unfit for animal consumption, because it contains these impurities. But it filters through the soil and emerges as a spring of crystal purity, having deposited in the soil all the fertilizing ingredients it contained, just where they were within reach of the hungry plants, which feed upon them. It would be hard to find, in the whole system of Nature's wonderful works, a more beautiful or perfect illustration than is here afforded of the simple and quiet manner in which the most important results are attained, and the economy which forbids the loss or waste of the smallest particle of the material with which her store-house is filled. But, in order to insure the retention in the soil of all this fertilizing material, it is essential that the water should filter through it and pass off. If its outflow is checked, and it remains stagnant, it retains its impurities, as is evinced by the nauseous character of the water of swamps and sloughs, as contrasted with that of springs. It has been estimated, and is susceptible of demonstration, that the fertilizing material imparted to the soil by the passage of rain water through it, is equivalent in the average rain fall of a year to three hundred weight of Peruvian guano per acre.

I have taken pains to explain at length the manner in which the elements thus restore to the earth continually the ingredients which furnish the food of plants, which in turn are consumed by animals and given off to the air by decay and combustion, to be again returned to the soil in a ceaseless round of active usefulness. Drainage is merely a mode of availing ourselves of the forces of nature, to secure results which man's unaided strength would fail to accomplish, and the above is only one of the forms in which we secure the benefits we seek.

It would exceed the limits within which this essay must be comprised to explain at equal length the various mechanical and chemical processes by which the action of natural agents is facilitated by means of underdrainage. Those who are curious on the subject, as every farmer should be, are referred to the treaties of French and Klippart on farm drainage, in which the history, theory, and present practice are given in detail, and which no land-owner can peruse without an increased interest in his possessions, and a keener perception of the possible development of their productive power. He will find it clearly proved and demonstrated by invariable experience that drainage lengthens the season of labor and vegetation, since drained lands are in condition for culture much earlier in the spring, and continue so much later in the fall, than those which are undrained. It promotes fine tilth by rendering the soil more friable. It prevents surface washing by allowing the water to percolate through the soil, thus securing the benefit of whatever fertilizing material it contains, instead of adding its own ingredients to those with which the water was previously charged. It diminishes evaporation, and thus raises the temperature of the soil.

It lessens the chance of the winter-killing of crops. It facilitates the hauling of loads, and renders the land less liable to injury from the treading of cattle. It facilitates the destruction of weeds, because the soil does not cling in a mass to their roots when torn up by the hand or plough.

It preserves a more equable degree of moisture in the soil under all circumstances, since it not only renders its saturation with water impossible, but keeps it in such a condition of pulverization, that in times of drought it absorbs moisture by capillary attraction from the air, and never becomes parched and baked as is the case with undrained lands. With proper drainage, the amount of moisture retained in the soil under all the varying circumstances of wet and dry seasons, can be so nearly equalized as to prevent the disastrous effects resulting from either extreme.

With such evidence of the truth of all these statements, that no room is left for argument in opposition, the question of drainage as an essential requisite to the highest condition of culture, of all lands not naturally drained by a subsoil of sand or gravel, may be considered as settled.

Whether it will pay to do it, however, must of course be determined, in every instance, by the proprietor himself, since he alone can judge of the relative value of the improvement to the condition of his own finances, which must form an important factor in the sum. In many cases, no doubt, the increased return would be so large, and would follow so immediately upon the improvement, that the proprietor would be justified in borrowing money for its execution. Such is the case with swamps and extensive sloughs, where land which was previously absolutely worthless, might be converted at once into fields of such fertility that the first crop would more than repay the outlay. If the proprietor is "well to do," and can afford the cost of drainage without inconvenience or embarrassment to himself, it is certain he can make no wiser investment than in a thorough, systematic, and judicious system of underdrainage, first of sloughs or swamps, and then of all uplands of a clayey nature or having a clay subsoil. It is worthy of remark, that the men in every community who spend their money most freely for substantial improvements of this kind (improvements which make no show except by the increased returns they afford), are the ones who, by their general good management, have acquired the character of money-making farmers; men who look very carefully at probable returns before expending a dollar. With them it is not an experiment. They know that drainage is just as essential to productiveness as thorough culture, and in fact thorough culture is impossible without it, and that farming, like any other business, must be done thoroughly, in order to be profitable.

And that last remark reminds me of the necessity of cautioning farmers against the folly and extravagance of attempting to do the work of drainage in a cheap and inefficient manner. There are indications that the conviction of the necessity of it has become so widespread that it will ere long be apt to break out in the form of an epidemic, in which the necessary precautions will be lost sight of in the feverish anxiety to secure the results, which are only the reward of conscientious performance of the work.

I have spoken elsewhere of the importance of securing even grades, particularly where the fall is slight. If a rapid descent in one place is succeeded by a nearly level grade, the pipes become filled and the water sets back, causing an outflow at the joints. For the same reason, the course of the drains should be as nearly straight as possible, since at every angle or curve there must be increased friction and pressure; and finally, it is important that the tiles should be smooth inside and the ends fitted neatly against each other, so that there may be the least possible interruption to the smooth and even flow of the water.

No portion of a system of drainage demands more careful consideration than the outlet. It is, of course, essential that it should be enough lower than any portion of the lands that are to be drained by it to admit of sufficient fall for the passage of water from the heads of its most distant tributaries. Yet it must be high enough above the level of whatever water it empties into to prevent danger of its being overflowed and the drainage water dammed back in the pipes; and, as I have already remarked, in all cases where there is not sufficient inequality of surface to render it obvious that every field on the farm can be drained into the mains without difficulty, the first point to determine in arranging the system of drainage is the lowest level at which the outlet can be set to insure a constant outflow. For of course the level of every other point must be determined by it, or at least must be high enough above it to secure a grade of at least 2½ or 3 inches in 100 feet. On level prairie farms it may sometimes be difficult to secure this fall without bringing the upper portions of the drains too near the surface for efficient action. It is better, therefore, to incur the small expense of having the levels taken before the work is begun, than run the risk of the great cost of reconstruction. Most farmers think themselves competent to the work of laying out and constructing their own drains without the aid of an engineer, or even a surveyor. But apart from the difficulty—I had almost said *impossibility*—of ascertaining the levels and arranging the grade of the bottoms of the ditches so as to preserve an even fall without careful adjusment by a leveling instrument, there is great danger that inexperienced persons may make mistakes in locating their drains, which may cost them very much more than the services of an engineer. The work should never be done without a careful consideration of the probabilities of future extension. The farmer may at first think only of redeeming a single tract of wet land, and lay his tiles with reference to that alone. But all experience proves that men who once begin the work of draining their farms are seldom satisfied till it has been extended over the whole area, and it often happens that the subsequent work involves the necessity of re-arranging that which was done first, an expense which might have been saved by timely forethought.

There can be no question that the wisest and best course to pursue, even if the land owner intends to do the work of construction himself, is to have a plan prepared by an experienced engineer, showing the exact location and depth of every main and side drain, after an accurate survey of the ground. With such a plan to refer to, the farmer can go on from year to year, doing as much or as little of the work as he may deem best, but always knowing what he is about, and working to one end. And when done, the same plan will enable him at any time thereafter to find any point to which he wishes to obtain access.

I do not purpose in this essay to give detailed instructions for the performance of the work of drainage, which would require greater space than can here be afforded; but my wish is to set forth the risks attendant upon poor construction, with sufficient clearness to warn the farmer against going to work ignorantly. If he then declines to employ an experienced man, or to procure and study the treatises which furnish detailed instructions, he takes his own risk, and has no one but himself to blame for the consequences of his own blunders.

One of the most common errors of inexperienced persons arises from the impression that tiles are a needless expense, and that the work can be as effectually done, and at much less cost, by using plank, stones, brush, or other cheap materials, or that the object can be attained by simply cutting ditches and leaving them open. It may sometimes be necessary in draining swamps to open a canal of sufficient depth and magnitude to carry off the outflow of all the drains. But except in such cases of necessity, open ditches are such a slovenly and wasteful mode of drainage that no farmer who has a just regard for principles of economy, or for his own reputation as an agriculturalist, would admit them as permanent occupants of his premises.

In places where stones are so plenty that they have to be gathered in piles, or carted off before cultivation can be successfully prosecuted, it may be less expensive at the outset to use them for drains, and for a time they will prove effective, but will inevitably become choked in a few years. There is little chance of such material being used in Illinois, but it is not unlikely that farmers may in many cases be tempted to construct their drains of plank. It is a "penny wise and pound foolish" economy to make use of any such perishable substitute for tiles, which, if of good quality and judiciously laid at a proper depth, may be relied upon as constituting a *permanent* improvement.

"In the whole process of draining," says an experienced engineer, "there is nothing more important than permanent and substantial work at the outlet." It is the point, of all others, where obstruction is most likely to occur. Everywhere else the tiles are protected by the earth above them, but the outlet is exposed to the action of frost, cattle, mischievous boys, and vermin and reptiles, which are sure to seek a harbor in its cavity unless prevented by a proper guard. It is essential, therefore, that the outlets shall be as few as possible, and always well secured by a frame-work of timber or stone, and guarded by grating or wire network, sufficiently fine to prevent the entrance of animals or reptiles of any kind.

So little thorough work of underdraining has been done in one part of the State, that it is difficult to find examples of upland drainage, without going outside our own boundaries. No man, however, who is familiar with its principles, will doubt the benefit of their application to our soil.

The report of this department for 1875 contains a valuable and interesting communication from Messrs. Spaulding & Co., nurserymen, near Riverton, Sangamon county, on the effect of draining a tract of 80 acres. The soil of the tract is a strong clay, or sandy loam subsoil, reddish clay, with occasional sandy loam intermixed. The inclination of the land is to the south, and it is intersected by three low ridges, two of which extend nearly across the tract, the other about half way. Most of the land would have been considered sufficiently dry for agricultural purposes, but the low land was too wet for cultivation.

Mains of 5-inch tile were laid between the ridges from 3 to 4½ feet deep, and laterals of 2, 3, and 4-inch tile were connected with them at intervals of 30 feet. This general plan was carried out over the whole area, and only varied as the character of the surface and economy of construction required. No great variation, however, was necessary, as the inclination of the surface was quite regular, and the laterals were mostly laid at right angles with the mains, except that, near the point of junction, they are curved a little, so as to discharge their currents somewhat in the same direction as that in the main.

They say of the results: "These tile drains have been in operation for the past six years. We have grown nursery stock most of the time on the entire 80 acres, and for our business the value of the land has been increased from one to two hundred per cent. We have no doubt that our success rests greatly on our tile drained land, and we believe it would prove of the utmost benefit to farmers generally, if they would lay mains of 4 and 5-inch tile in the depressions of their lands, and so locate them that they could at any time in the future attach all the necessary laterals. From our experience in tile draining, and the benefits derived therefrom, we have no doubt that there are very many farms of 160 acres in the State of Illinois, on which a single mile of drain tile, properly located at a cost of $175 or $200, would enhance the value of the farm $1,000. The past very wet season has proved more than ever to us the value of the drain, since we never before made so perfect a success of all our nursery crops."

This brief but succinct statement comprises in itself all the essential truths which any amount of experience could furnish, and it is very evident that a realizing sense of the necessity of underdrainage, in order to the development of the full productive powers of the land, is becoming widely established in the minds of farmers throughout the State.

Manufactories of drain tiles are increasing rapidly, and those which are already established, and are known as reliable for good work, can hardly keep pace with the increasing demand for their wares. There is great room for deception in the manufacture by the use of poor clay, or even clayey loam mixed with clay, and there can be no more foolish economy than in laying poor tiles because they can be had at a low price.

The drainer's work, like the undertaker's, is buried out of sight; but though it may be true that "dead men tell no tales," it is by no means true that drain tiles will preserve the secret of rascality that is buried with them. If defective, they will certainly make it known, and the proprietor must suffer the penalty of his own penuriousness by being forced to do the work over again.

In the whole catalogue of agricultural operations there is no one which demands more care, to secure good material and thorough work, than tile drainage. In treating the question of its cost, it is not putting it fairly to state simply its cash value. A cash estimate looks larger to farmers than an estimate in labor. Drainage can be performed principally by the same labor as fencing. If a plan for the work is first carefully prepared, the labor of its performance may be extended over a series of years, so that no oppressive burden need be assumed at once, and every year's work will be an advance toward the completion of a full and perfect system, which, once established, will constitute a permanent addition to the productive powers of the farm. Labor thus performed at periods of comparative leisure, cannot justly be estimated at the rates at which it could be secured on contract, but should rather be regarded by the farmer as an investment of time and labor which would otherwise be turned to no profitable account. Few farm operations would pay expenses if every hour of superintendence, and every hour of labor of man, boy, and beast, were charged at its cash value.

The ordinary cost of cutting ditches and laying tile at an average depth of three feet may be stated at thirty cents per rod, when done by hand. There are various machines for expediting the labor of cutting the ditches and laying the tile, some of which, there is every reason to believe, are effective, and capable of reducing very considerably the cost of the work. With the increasing demand, these machines will doubtless become common, and their proprietors will make a fair profit by taking work on contract at such low prices as will render hand-labor extravagant in comparison. Unfortunately, the habit of puffing worthless as well as valuable articles has become so common, that all published commendations are regarded with suspicion, and I refrain, therefore, from offering an opinion on the merits of any of the machines which have been introduced. For a similar reason I decline to recommend any particular manufactory of drain tile, but simply express my conviction that the best is the cheapest, and a little care in investigation will enable an inquirer to ascertain where a reliable article can be had.

Doubtless much money and labor will be vainly expended on cheap material and shallow work, by men of shallow brains, before the folly of such attempts will become fully appreciated. But the great question will not be affected by the blunders of individuals, and the work of drainage will go on in a rapidly increasing ratio, which will make itself manifest in the enormous aggregate increase of cereal productions.

It has been said by distinguished agriculturalists that Illinois comprises in one body the largest area of equally fertile lands to be found on the face of the globe. It may be added, that the only thing wanted for the full development of its productive power is thorough and systematic underdrainage.

What is said in the foregoing article regarding land drainage for the State of Illinois is equally applicable to all the similar lands in Kentucky.

WEATHER REPORTS.

War Department, Office of Chief Signal Officer,
Div'n T'leg'ms & Rep'ts for B'nefit of Com'rce & Ag'culture,
Washington, D. C., November 29th, 1878.

Col. W. J. Davie, *State Commissioner of Agriculture, Louisville, Ky.:*

Sir: Referring to your application made to the Sergeant in charge of Signal Service Station of Observation at Louisville, Kentucky, I am directed to transmit to you herewith a table showing mean daily barometer, maximum, minimum, and mean daily temperature, mean daily relative humidity, prevailing direction of wind, rain-fall, and character of the day, from November 1, 1877, to November 20, 1878, at Louisville, Kentucky, compiled from the records of that station.

Very respectfully,

H. H. C. DUNWOODY,

1st Lieut. 4th Artillery, Acting Signal Officer and Ass't.

Care Sergeant Wm. R. Stansbury, *Signal Corps, U. S. Army.*

Office of Observations, Signal Corps, U. S. A.,
Louisville, Kentucky, December 2d, 1878.

Col. W. J. Davie, *State Commissioner of Agriculture of Kentucky, Frankfort, Kentucky:*

Sir: I have the honor to forward herewith the data compiled by me for your Annual Report, duly approved by the Chief Signal Officer.

I am, sir, very respectfully,

WM. R. STANSBURY,

Sergeant Signal Corps, U. S. Army.

OFFICE OF OBSERVATIONS, LOUISVILLE, KY.,
SIGNAL SERVICE U. S. A.

*TABLE

Showing Mean Daily Barometer, Maximum, Minimum, and Mean Daily Temperature, Mean Daily Relative Humidity, Prevailing Direction of Wind, Rain-fall (in inches), and Character of Day, from November 1st, 1877, to November 20th, 1878, at Louisville, Kentucky.

NOVEMBER, 1877.

DATE		Mean daily barometer.	TEMPERATURE.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
			Mean daily.	Maximum.	Minimum				
1877.									
November	1.	29.692	48.7	55	40	86.7	S. E.	.39	Cloudy.
"	2	29.909	47.2	56	47	66.7	S. W.	.20	Cloudy.
"	3.	30.220	48.5	55	40	57.0	S.	.00	Clear.
"	4.	30.076	54.0	63	41	56.0	S.	.00	Fair.
"	5.	30.104	46.5	59	39	76.0	S. W.	.29	Cloudy.
"	6.	30.410	35.5	43	30	68.7	N. E.	.00	Clear.
"	7.	30.049	50.7	58	34	61.3	S. E.	.00	Cloudy.
"	8.	29.668	53.5	60	48	84.0	S. W.	1.39	Cloudy.
"	9.	30.109	41.0	50	37	81.3	N.	.02	Cloudy.
"	10.	30.433	37.0	40	34	70.7	N.	.00	Fair.
"	11.	30.408	39.7	46	30	71.3	S. E.	.00	Clear.
"	12	30.275	47.7	58	33	58.0	S. E.	.00	Clear.
"	13.	30.200	52.0	62	37	61.7	S. E.	.00	Fair.
"	14.	30.091	58.7	68	45	65.7	S.	.11	Cloudy.
"	15.	30.084	59.0	62	56	79.3	W.	.16	Cloudy.
"	16.	30.097	57.0	64	49	72.3	S.	.00	Fair.
"	17.	30.090	55.2	62	51	61.7	W.	.00	Clear.
"	18.	30.366	42.7	51	36	67.7	N. E.	.00	Clear.
"	19.	30.297	47.5	55	38	56.0	N. E.	.00	Fair.
"	20.	30.138	53.7	61	41	57.3	E.	.00	Cloudy.
"	21.	29.904	54.2	56	50	93.0	S. E.	1.06	Cloudy.
"	22.	30.031	47.7	55	47	92.0	N.	.02	Cloudy.
"	23.	29.884	50.0	52	46	97.7	N.	.04	Cloudy.
"	24.	29.791	51.7	53	49	90.7	N. W.	.06	Cloudy.
"	25.	29.509	51.0	54	47	95.3	S. E.	.34	Cloudy.
"	26.	29.541	46.5	50	46	87.3	S. W.	.40	Cloudy.
"	27.	29.845	44.7	50	42	65.7	S. W.	.01	Cloudy.
"	28.	30.095	37.0	44	32	68.7	W.	*——	Cloudy.
"	29.	30.130	24.5	32	23	73.3	W.	*——	Cloudy.
"	30.	30.259	26.2	28	20	72.3	W.	*——	Fair.

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* These tables were compiled and furnished this Bureau by that excellent and accomplished officer at Louisville, W. R. Stansbury, Sergeant U. S. A. S. C.

DECEMBER, 1877.

Date.	Mean daily barometer.	Temperature.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1877.								
December 1 .	30.340	30.2	32	27	71.3	W.	——	Cloudy.
" 2 .	30.425	34.0	38	26	64.3	S. E.	.00	Clear.
" 3 .	30.191	42.2	50	32	54.7	S. E.	.00	Fair.
" 4 .	29.786	52.2	56	42	92.3	S.	.87	Cloudy.
" 5 .	29.863	40.5	55	39	72.3	W.	.23	Cloudy.
" 6 .	30.277	33.5	39	32	72.3	W.	——	Cloudy.
" 7 .	30.281	42.2	50	30	61.0	S. W.	.00	Clear.
" 8 .	30.374	38.2	46	34	52.7	W.	.00	Clear.
" 9 .	30.338	36.7	43	29	63.3	S.	.00	Clear.
" 10 .	30.250	47.2	54	36	52.7	S. W.	.00	Fair.
" 11 .	30.231	55.0	63	46	49.7	S. W.	.00	Clear.
" 12 .	30.218	55.5	64	47	42.0	S. W.	.00	Clear.
" 13 .	30.300	50.0	60	43	49.7	N. W.	.00	Clear.
" 14 .	30.387	42.7	49	34	67.3	N.	.00	Clear.
" 15 .	30.155	55.5	62	40	49.7	S. W.	——	Fair.
" 16 .	30.163	59.7	64	55	70.7	S.	——	Cloudy.
" 17 .	30.179	60.5	61	57	94.0	S. W.	.09	Cloudy.
" 18 .	30.187	61.5	67	58	76.3	S.	——	Cloudy.
" 19 .	30.216	60.7	67	54	68.0	S.	.00	Clear.
" 20 .	30.266	54.2	67	43	76.7	N. E.	.00	Clear.
" 21 .	30.194	58.2	66	47	70.0	E.	.00	Fair.
" 22 .	30.161	56.7	63	54	87.3	S. E.	.36	Cloudy.
" 23	30.197	58.2	62	52	87.7	E.	.08	Cloudy.
" 24	29.981	59.2	60	54	90.0	S. E.	.55	Cloudy.
" 25 .	29.813	56.5	59	54	98.0	S. E.	.32	Cloudy.
" 26 .	29.804	53.2	59	50	93.3	N.	.00	Cloudy.
" 27 .	29.938	47.7	50	46	97.3	N. E.	.08	Cloudy.
" 28 .	29.992	47.5	48	45	87.3	N. E.	.00	Cloudy.
" 29 .	29.547	46.5	48	43	90.0	N. E.	1.42	Cloudy.
" 30 .	29.753	38.5	46	37	87.0	N.	.19	Cloudy.
" 31 .	30.019	39.0	42	34	69.3	N. W.	. .	Cloudy.

JANUARY, 1878.

1878.								
January 1 . .	29.977	42.2	47	36	52.3	S. W.	.00	Fair.
" 2 . .	30.129	33.5	40	30	60.3	N.	——	Fair.
" 3 . .	30.013	35.0	40	26	63.0	S. E.	.28	Fair.
" 4	30.063	29.5	38	20	76.7	W.	.24	Cloudy.
" 5 . .	30.283	22.7	30	13	62.0	S. W.	.00	Clear.
" 6 . .	30.461	19.2	25	16	57.3	W.	.00	Clear.
" 7 . .	30.606	15.5	22	6	62.3	S. E.	——	Clear.
" 8 . .	30.359	31.5	40	10	57.0	S.	.00	Cloudy.
" 9 . .	30.047	42.2	46	35	60.7	S. E.	.00	Cloudy.
" 10 . .	29.816	40.2	42	38	76.7	S. W.	.02	Cloudy.
" 11 . .	30.050	40.7	45	36	57.3	W.	——	Fair.
" 12 . .	30.036	40.2	45	32	59.7	E.	.00	Fair.
" 13 . .	29.702	45.2	50	37	79.7	N. E.	.30	Cloudy.
" 14 . .	29.956	39.2	46	38	70.3	N. W.	.08	Cloudy.
" 15 . .	30.134	35.7	38	35	65.0	W.	.00	Cloudy.

JANUARY, 1878—Continued.

DATE.	Mean daily barometer.	TEMPERATURE.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
January 16 . .	30.190	39.5	43	35	56.0	S. W.	.00	Fair.
" 17 . .	30.108	43.2	51	34	53.7	S.	.00	Clear.
" 18 . .	30.163	46.2	55	38	58.7	S.	.00	Clear.
" 19 . .	29.978	47.0	52	35	67.3	E.	.09	Cloudy.
" 20 . .	29 771	50.2	55	48	72.7	S. W.	.22	Cloudy.
" 21 . .	29.898	43.7	48	40	78.7	W.	——	Cloudy.
" 22 . .	29.991	40.2	45	36	60.0	W.	——	Cloudy.
" 23 . .	30.351	31.0	40	28	65.3	E.	.00	Clear.
" 24 . .	30.068	46.2	55	30	55.0	S.	.00	Fair.
" 25 . .	29.956	48.7	50	47	75.5	S.	.09	Fair.
" 26 . .	30.036	44.5	50	38	61.7	S. W.	——	Fair.
" 27 . .	29.700	45.2	56	41	77.7	S. W.	.82	Cloudy.
" 28 . .	30.019	37.0	43	35	72.3	W.	.00	Cloudy.
" 29 . .	30.118	34.5	37	32	61.0	E.	.00	Cloudy.
" 30 . .	29.772	32.2	35	30	79.7	N. E.	.74	Cloudy.
" 31 . .	29.561	34.5	36	31	86.3	N. E.	.37	Cloudy.

FEBRUARY, 1878.

1878.								
February 1 . .	29.901	38.7	40	33	75.0	S. W.	.15	Cloudy.
" 2 . .	30.226	34.7	37	30	63.7	N.	——	Cloudy.
" 3 . .	30.200	31.7	33	30	72.3	N.	.00	Cloudy.
" 4 . .	30.081	34.7	37	30	67.7	S. W.	.00	Fair.
" 5 . .	30.099	38.2	45	29	61.7	S. E.	.00	Clear.
" 6 . .	30.074	43.2	55	35	54.0	S. E.	.00	Clear.
" 7 . .	29.673	45.7	53	35	62.7	E.	.24	Fair.
" 8 . .	29.344	46.7	50	43	82.3	S. W.	.70	Cloudy.
" 9 . .	29.463	44.7	52	39	76.7	S. W.	.36	Cloudy.
" 10 . .	29.733	32.0	40	30	86.0	W.	.02	Cloudy.
" 11 . .	30.099	31.7	39	25	59.3	N. W.	——	Fair.
" 12 . .	29.913	41.5	51	31	63.0	S.	.00	Fair.
" 13 . .	29.806	43.2	48	41	62.3	S. E.	.00	Fair.
" 14 . .	29.727	44.2	50	37	65.7	N. E.	——	Cloudy.
" 15 . .	29.920	46.0	51	38	64.0	N. E.	.01	Cloudy.
" 16 . .	30.002	47.5	55	38	69.0	S.	.00	Fair.
" 17 . .	29.979	46.7	51	40	63.3	N. W.	.03	Fair.
" 18 . .	30.185	39.0	45	37	53.0	N. W.	.00	Fair.
" 19 . .	29.932	47.0	56	35	57.0	S. E.	.00	Fair.
" 20 . .	29.728	53.5	57	49	67.3	S.	.18	Cloudy.
" 21 . .	29.274	57.2	65	51	71.0	S. E.	.51	Cloudy.
" 22 . .	29.678	45.0	56	43	74.0	S. W.	.05	Cloudy.
" 23 . .	29.935	43.5	50	41	61.0	N. W.	——	Fair.
" 24 . .	30.022	41.0	49	37	50.0	W.	.00	Fair.
" 25 . .	30.305	39.2	45	34	57.0	W.	.00	Fair.
" 26 . .	30.365	36.5	45	29	48.3	N. E.	.00	Clear.
" 27 . .	30.165	42.2	51	32	55.0	N. E.	.00	Clear.
" 28 . .	30.110	46.7	56	35	47.3	N. E.	.00	Clear.

MARCH, 1878.

DATE.	Mean daily barometer.	TEMPERATURE.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
March 1 . . .	30.038	52.5	65	36	46.0	S. E.	.00	Clear.
‘‘ 2 . . .	29.624	53.2	64	51	77.7	S. W.	1.23	Cloudy.
‘‘ 3 . . .	29.635	42.0	55	38	77.3	W.	.14	Cloudy.
‘‘ 4 . . .	30.110	38.7	43	36	60.7	N. W.	.00	Fair.
‘‘ 5 . . .	30.091	51.7	61	36	42.7	S.	.00	Clear.
‘‘ 6 . . .	30.010	59.0	63	52	53.7	S.	.00	Fair.
‘‘ 7 . . .	30.023	63.5	70	58	61.7	S. W.	.00	Fair.
‘‘ 8 . . .	30.037	65.2	74	56	55.0	S. E.	.00	Fair.
‘‘ 9 . . .	30.024	66.7	73	59	49.3	S. E.	.00	Cloudy.
‘‘ 10 . . .	29.863	60.2	68	56	57.0	S. E.	.23	Fair.
‘‘ 11 . . .	29.893	57.5	69	51	80.7	N. E.	——	Cloudy.
‘‘ 12 . . .	29.672	53.0	60	51	84.0	N. E.	1.56	Fair.
‘‘ 13 . . .	29.855	55.7	61	48	57.0	S. W.	.07	Fair.
‘‘ 14 . . .	30.074	49.2	54	46	53.7	W.	.10	Fair.
‘‘ 15 . . .	30.151	48.2	55	39	51.0	N.	.00	Clear.
‘‘ 16 . . .	29.936	52.7	66	45	41.7	W.	.00	Fair.
‘‘ 17 . . .	30.085	44.7	53	42	56.3	W.	.00	Cloudy.
‘‘ 18 . . .	30.227	45.2	50	40	66.0	N. E.	.00	Fair.
‘‘ 19 . . .	30.128	53.5	62	36	49.3	S. W.	.00	Fair.
‘‘ 20 . . .	30.115	53.5	63	45	46.0	N. E.	.00	Clear.
‘‘ 21 . . .	29.957	58.7	73	46	48.0	S. E.	.00	Clear.
‘‘ 22 . . .	30.054	53.7	63	43	46.7	N. E.	.00	Clear.
‘‘ 23 . . .	29.746	63.0	75	46	48.7	S. W.	.00	Fair.
‘‘ 24 . . .	29.853	39.7	64	31	39.0	N. W.	.00	Clear.
‘‘ 25 . . .	30.031	37.7	47	26	40.0	N.	.00	Clear.
‘‘ 26 . . .	29.810	55.7	68	38	35.7	S.	.00	Clear.
‘‘ 27 . . .	29.518	63.2	75	55	51.3	S.	.06	Cloudy.
‘‘ 28 . . .	29.700	50.0	68	42	70.3	N. W.	.10	Cloudy.
‘‘ 29 . . .	30.052	45.7	54	38	53.0	N. E.	.00	Fair.
‘‘ 30 . . .	29.740	57.2	70	42	65.7	S. W.	.57	Fair.
‘‘ 31 . . .	29.994	46.2	58	42	48.7	W.	——	Cloudy.

APRIL, 1878.

1878.								
April 1 . . .	29.970	51.5	58	43	50.3	W.	.00	Fair.
‘‘ 2 . . .	29.836	55.5	65	45	48.0	S.	.00	Clear.
‘‘ 3 . . .	29.565	53.7	65	45	60.7	N. E.	.10	Cloudy.
‘‘ 4 . . .	29.576	55.5	61	48	42.0	S. W.	.19	Fair.
‘‘ 5 . . .	29.593	56.7	64	45	36.0	W.	.00	Fair.
‘‘ 6 . . .	29.736	53.5	60	49	26.7	N. W.	.00	Clear.
‘‘ 7 . . .	29.898	53.7	63	42	41.3	E.	.00	Clear.
‘‘ 8 . . .	29.677	61.7	74	48	52.0	S. E.	.05	Cloudy.
‘‘ 9 . . .	29.484	65.0	79	58	76.0	S.	.72	Cloudy.
‘‘ 10 . . .	29.783	58.0	66	53	38.7	S. W.	.47	Fair.
‘‘ 11 . . .	29.750	60.2	67	49	28.0	S. W.	.00	Fair.
‘‘ 12 . . .	29.699	66.2	76	55	35.7	S. W.	.00	Clear.
‘‘ 13 . . .	29.723	64.2	72	56	52.3	N. E.	.00	Cloudy.
‘‘ 14 . . .	29.689	59.2	65	55	70.3	E.	.47	Cloudy.
‘‘ 15 . . .	29.760	63.5	73	56	73.7	N. E.	.13	Cloudy.

APRIL, 1878—Continued.

Date.	Mean daily barometer.	Temperature.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
April 16	29.948	64.0	73	51	58.7	N. E.	.00	Clear.
" 17	29.940	66.5	77	55	57.7	N. E.	.00	Clear.
" 18	29.955	64.0	70	62	73.0	S.	.31	Fair.
" 19	29.887	68.0	76	61	66.0	S.	.00	Fair.
" 20	29.880	68.0	73	64	70.7	S. W.	—	Fair.
" 21	29.888	71.0	80	57	64.0	S. E.	.00	Fair.
" 22	29.776	75.2	82	68	62.3	S. W.	—	Cloudy.
" 23	29.616	69.2	77	64	68.7	S. E.	.72	Cloudy.
" 24	29.576	60.0	71	56	67.3	S. W.	.14	Cloudy.
" 25	29.651	58.0	67	53	58.3	S. W.	.23	Fair.
" 26	29.718	55.2	62	52	61.7	S. W.	—	Cloudy.
" 27	29.875	53.0	59	50	67.0	W.	—	Cloudy.
" 28	29.870	56.0	61	49	67.0	W.	—	Cloudy.
" 29	29.787	62.0	70	53	64.3	W.	—	Cloudy.
" 30	29.900	67.0	76	54	50.3	W.	.00	Clear.

MAY, 1878.

1878.								
May 1	29.916	70.5	81	57	50.3	S.	.00	Clear.
" 2	29.733	74.0	82	62	48.3	S.	.00	Fair.
" 3	29.786	60.7	72	57	82.3	S. W.	1.32	Cloudy.
" 4	29.868	58.5	67	50	42.3	W.	—	Fair.
" 5	29.846	61.0	68	57	48.3	S. W.	.00	Clear.
" 6	29.840	66.7	78	48	53.3	S.	.00	Fair.
" 7	29.829	68.2	79	63	61.7	S. W.	.20	Fair.
" 8	29.833	65.7	74	61	74.0	S. W.	.45	Fair.
" 9	30.056	61.0	71	53	40.7	W.	.00	Fair.
" 10	30.094	56.7	62	48	40.0	W.	.00	Fair.
" 11	30.078	55.7	63	47	49.7	W.	—	Fair.
" 12	30.058	48.7	53	45	73.3	N.	.15	Fair.
" 13	30.047	47.2	54	41	64.0	N. E.	.19	Cloudy.
" 14	29.936	52.0	58	44	56.3	N. E.	.06	Fair.
" 15	30.011	54.7	63	43	44.0	N.	.00	Clear.
" 16	29.862	53.2	57	52	80.0	S. E.	.15	Cloudy.
" 17	29.936	57.0	64	53	79.3	N.	.84	Fair.
" 18	29.828	68.0	82	51	71.3	E.	.28	Fair.
" 19	29.766	72.3	81	66	69.3	S.	.06	Fair.
" 20	29.902	76.2	85	66	52.0	S. W.	.01	Clear.
" 21	30.076	68.7	76	64	51.7	N.	.00	Clear.
" 22	30.055	67.5	75	54	54.3	E.	.00	Fair.
" 23	29.915	76.2	85	62	74.3	S.	.03	Fair.
" 24	29.942	77.5	83	73	57.7	S. W.	.00	Cloudy.
" 25	29.821	71.5	79	67	74.7	S. W.	.75	Cloudy.
" 26	29.791	69.7	77	65	57.3	S. W.	.01	Fair.
" 27	29.848	69.5	76	58	51.0	S. W.	.00	Clear.
" 28	30.002	68.7	76	56	48.0	N.	.00	Clear.
" 29	29.899	74.0	85	59	54.0	S.	.00	Clear.
" 30	29.946	69.0	78	63	65.0	N.	.00	Cloudy.
" 31	30.085	67.5	76	56	46.0	E.	.00	Clear.

JUNE, 1878.

DATE.	Mean daily barometer.	TEMPERATURE.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878								
June 1. . . .	29.999	72.7	84	57	45.7	S. E.	.00	Fair.
‘‘ 2. . . .	29.800	77.7	91	62	51.7	S. E.	.00	Fair.
‘‘ 3. . . .	29.815	76.2	89	71	68.0	S. W.	.29	Fair.
‘‘ 4. . . .	29.918	73.5	82	67	56.0	N. W.	.00	Fair.
‘‘ 5. . . .	30.096	66.2	74	55	44.0	N. E.	.00	Clear.
‘‘ 6. . . .	29.989	65.0	74	57	37.3	E.	.00	Fair.
‘‘ 7. . . .	29.710	69.2	79	55	56.3	S.	.02	Cloudy.
‘‘ 8. . . .	29.606	67.0	73	64	62.0	N. W.	.00	Fair.
‘‘ 9. . . .	29.570	61.7	73	56	71.0	S. E.	.47	Cloudy.
‘‘ 10. . . .	29.894	59.7	72	54	56.7	N. W.	——	Fair.
‘‘ 11. . . .	29.929	65.0	74	55	66.0	S. W.	.05	Cloudy.
‘‘ 12. . . .	30.000	66.0	72	60	62.0	N. E.	.01	Cloudy.
‘‘ 13. . . .	30.067	70.0	78	57	45.3	N. E.	.00	Fair.
‘‘ 14. . . .	29.990	76.5	86	64	50.7	S.	.00	Fair.
‘‘ 15. . . .	29.909	77.7	83	68	59.7	S.	——	Cloudy.
‘‘ 16. . . .	29.815	77.2	86	71	64.7	S. W.	.00	Fair.
‘‘ 17. . . .	29.839	67.2	75	64	87.7	N. E.	2.81	Cloudy.
‘‘ 18. . . .	29.902	68.7	75	61	71.7	N.	.11	Fair.
‘‘ 19. . . .	29.902	71.5	81	60	62.3	N.	.00	Clear.
‘‘ 20. . . .	29.731	74.5	83	63	61.3	S. W.	.32	Cloudy.
‘‘ 21. . . .	29.745	63.0	71	59	60.0	N. W.	.20	Cloudy.
‘‘ 22. . . .	29.874	64.0	71	55	55.3	N. W.	.00	Fair.
‘‘ 23. . . .	29.953	70.2	79	61	46.0	W.	.00	Fair.
‘‘ 24. . . .	29.984	75.7	83	62	48.0	N. W.	.00	Clear.
‘‘ 25. . . .	29.952	77.3	87	64	55.7	S.	.00	Clear.
‘‘ 26. . . .	29.987	81.0	90	73	50.7	S.	.00	Fair.
‘‘ 27. . . .	30.065	80.0	91	73	63.7	S.	.95	Fair.
‘‘ 28. . . .	30.061	81.2	91	69	63.0	S. W.	.01	Fair.
‘‘ 29. . . .	30.019	80.0	87	71	63.7	S.	——	Fair.
‘‘ 30. . . .	29.984	77.0	86	72	72.7	S.	.10	Cloudy.

JULY, 1878.

1878.								
July 1. . . .	29.875	79.5	91	69	65.7	S. W.	.00	Fair.
‘‘ 2. . . .	29.901	72.2	77	70	85.7	N.	.42	Cloudy.
‘‘ 3. . . .	29.968	77.7	85	70	78.7	N.	.18	Cloudy.
‘‘ 4. . . .	29.978	82.0	92	72	62.3	N. E.	——	Fair.
‘‘ 5. . . .	29.943	81.5	91	73	69.3	N.	.00	Fair.
‘‘ 6. . . .	29.929	81.0	94	73	65.3	N. E.	——	Fair.
‘‘ 7. . . .	29.912	82.2	91	73	64.0	S. W.	.01	Fair.
‘‘ 8. . . .	29.925	78.5	89	75	76.3	S.	1.10	Cloudy.
‘‘ 9. . . .	29.953	83.7	93	74	68.7	S. W.	.00	Fair.
‘‘ 10. . . .	30.010	84.5	93	75	63.7	S. W.	.00	Fair.
‘‘ 11. . . .	30.044	86.7	96	76	62.7	S. W.	.00	Clear.
‘‘ 12. . . .	30.019	87.7	95	78	60.0	S. W.	.00	Fair.
‘‘ 13. . . .	29.962	81.7	91	77	70.7	S. W.	.48	Fair.
‘‘ 14. . . .	29.913	84.5	92	74	65.0	N.	.00	Clear.
‘‘ 15. . . .	29.880	86.5	92	76	57.3	N. E.	.00	Fair.
‘‘ 16. . . .	29.870	86.7	93	76	55.0	N. E.	.00	Clear.

JULY, 1878—Continued.

Date.	Mean daily barometer.	Temperature.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
July 17. . . .	29.876	88.7	97	78	56.7	S. W.	.00	Clear.
" 18. . . .	29.868	88.0	97	80	58.7	S. W.	———	Clear.
" 19. . . .	29.878	85.7	92	80	62.3	N. W.	.00	Fair.
" 20. . . .	29.890	85.2	94	77	62.3	N. W.	———	Fair.
" 21. . . .	29.850	82.2	93	76	54.7	N. W.	.00	Clear.
" 22. . . .	29.991	73.5	82	64	52.3	N.	.00	Fair.
" 23. . . .	30.057	74.7	82	64	42.0	N. E.	.00	Clear.
" 24. . .	29.966	76.5	87	65	44.0	N.	.00	Clear.
" 25. . . .	29.754	82.5	92	69	51.7	S. W.	.00	Fair.
" 26. . . .	29.616	79.0	87	74	70.3	S. W.	1.73	Cloudy.
" 27. . . .	29.891	77.2	83	70	67.0	N.	.01	Cloudy.
" 28. . . .	29.943	79.5	86	70	61.7	N. E.	.00	Cloudy.
" 29. . . .	29.844	79.0	86	76	75.0	S.	.10	Cloudy.
" 30. . . .	29.878	82.0	90	75	63.3	W.	.05	Fair.
" 31. . . .	29.909	84.2	92	73	59.0	S. W.	.00	Clear.

AUGUST, 1878.

1878.								
August 1. . .	29.902	82.5	93	74	60.3	S. W.	.00	Fair.
" 2. . .	29.853	82.0	90	73	54.3	N. W.	.00	Fair.
" 3. . .	29.819	83.2	91	72	55.0	S. W.	.00	Clear.
" 4. . .	29.810	81.5	90	70	54.3	N.	.34	Clear.
" 5. . .	29.787	83.0	92	72	55.0	W.	.00	Clear.
" 6. . .	29.808	84.5	93	74	50.0	W.	.00	Clear.
" 7. . .	29.904	81.2	89	71	47.3	N.	.00	Clear.
" 8. . .	29.872	80.7	95	68	54.0	N. E.	———	Fair.
" 9. . .	29.817	82.2	95	76	63.7	S. W.	.35	Cloudy.
" 10. . .	29.859	75.7	82	72	79.7	S. W.	.64	Cloudy.
" 11. . .	29.929	77.2	85	71	62.7	N. W.	.05	Fair.
" 12. . .	29.899	78.2	86	68	53.7	N. W.	.00	Fair.
" 13. .	29.839	78.0	86	69	51.7	N. W.	.00	Clear.
" 14. . .	29.809	77.0	88	68	56.0	S. W.	.00	Clear.
" 15. . .	29.965	78.2	89	69	56.3	S. W.	.30	Fair.
" 16. . .	29.994	83.7	91	74	52.7	W.	.00	Clear.
" 17. . .	30.032	80.0	87	73	65.0	N.	———	Fair.
" 18. . .	29.950	83.7	94	72	62.7	S. W.	.00	Fair.
" 19. . .	29.850	83 2	96	77	62.7	W.	.63	Fair.
" 20. . .	29.799	77.7	82	75	79.3	N.	1.26	Fair.
" 21. .	29.903	75.5	83	69	58.7	N. E.	.00	Clear.
" 22. . .	29.998	74.7	83	65	55.0	N.	.00	Clear.
" 23. . .	29.995	77.2	85	67	59.0	N. W.	.00	Clear.
" 24. . .	29.905	80.7	90	68	55.3	S. W.	.00	Fair.
" 25. . .	29.891	72.5	80	67	62.3	N. E.	.18	Fair.
" 26. . .	29.848	72.0	81	59	53.0	N.	.00	Clear.
" 27. . .	29.843	74.7	84	63	52.7	N.	.00	Clear.
" 28. . .	29.864	76.5	87	65	57.7	S. W.	———	Fair.
" 29. . .	29.947	72.7	81	66	67.0	N.	.00	Fair
" 30. . .	29.910	73.5	80	66	75.3	N. E.	.03	Cloudy.
" 31. . .	29.901	76.7	84	71	73.0	S. W.	.43	Fair.

SEPTEMBER, 1878.

Date.	Mean daily barometer.	Temperature.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
September 1.	30.037	75.2	82	72	74.7	S. W.	.00	Fair.
" 2.	29.972	78.7	89	69	58.0	S.	.00	Clear.
" 3.	29.946	77.0	85	71	55.7	N.	.00	Clear.
" 4.	29.984	73.7	82	65	61.7	N.	.00	Clear.
" 5.	30.013	73.7	82	64	61.3	N.	.00	Clear.
" 6.	30.028	76.7	88	64	55.7	N.	.00	Clear.
" 7	30.032	80.0	91	67	57.7	S. E.	——	Clear.
" 8.	30.025	80.0	89	72	60.0	S.	.00	Fair.
" 9.	29.952	78.7	88	70	58.0	S.	.00	Fair.
" 10.	30.026	66.7	77	63	84.0	N.	.02	Cloudy.
" 11.	30.101	56.5	63	55	81.0	N.	.73	Cloudy.
" 12.	29.939	60.2	64	55	71.0	N.	.00	Cloudy.
" 13.	30.008	61.5	70	53	59.3	N. W.	.00	Clear.
" 14.	30.194	64.5	71	52	57.3	N. W.	.00	Clear.
" 15.	30.218	63.7	77	51	55.0	N.	.00	Clear.
" 16.	30.160	67.7	79	53	50.7	S. E.	.00	Clear.
" 17.	30.137	70.0	83	56	53.3	S.	.00	Clear.
" 18.	30.132	73.0	85	61	54.7	S.	.00	Clear.
" 19.	29.975	76.2	88	65	54.0	S.	.00	Clear.
" 20.	29.915	66.7	81	65	75.3	S.	.66	Cloudy.
" 21.	30.159	58.0	68	53	53.7	N.	.06	Clear.
" 22.	30.218	61.2	72	48	50.7	E.	.00	Clear.
" 23.	30.083	66.0	78	53	70.7	S. E.	.00	Fair.
" 24.	30.131	68.7	74	66	78.3	S.	.00	Fair.
" 25.	30.042	70.2	84	61	68.3	S.	.65	Fair.
" 26.	30.288	60.7	70	57	62.7	N.	.09	Fair.
" 27.	30.274	58.2	68	50	52.3	N. E.	.00	Cloudy.
" 28.	30.125	62.2	66	50	78.7	E.	.31	Cloudy.
" 29.	30.043	71.7	81	63	71.7	S. E.	.00	Fair.
" 30.	29.968	73.0	83	64	67.0	S.	.00	Clear.

OCTOBER, 1878.

1878.								
October 1. .	29.900	74.2	83	66	58.7	S.	.00	Clear.
" 2. .	30.013	69.2	77	64	63.0	N.	.06	Fair.
" 3. .	30.080	66.5	79	54	58.7	N.	.00	Clear.
" 4	30.073	66.2	80	55	54.3	S.	.00	Fair.
" 5. .	30.123	54.0	63	48	67.0	N.	——	Cloudy.
" 6. .	30.163	54.7	66	42	50.0	E.	.00	Clear.
" 7. .	30.045	64.0	75	50	61.3	S. W.	.00	Fair.
" 8. .	30.000	70.2	82	55	65.3	S. W.	.00	Fair.
" 9. .	30.041	69.5	75	64	80.0	S. W.	1.01	Cloudy.
" 10. .	29.977	63.0	68	60	65.3	N. E.	——	Cloudy.
" 11. .	30.006	57.0	68	53	71.7	N.	.66	Fair.
" 12. .	30.178	54.2	63	44	54.7	N. E.	.00	Clear.
" 13. .	30.046	62.2	74	45	57.3	S.	.00	Fair.
" 14. .	30.027	68.2	78	60	59.3	S.	.00	Clear.
" 15. .	29.972	70.7	80	64	59.0	S.	——	Fair.

OCTOBER, 1878—Continued.

DATE.	Mean daily barometer.	TEMPERATURE.			Mean daily relative humidity.	Prevailing direction of wind.	Rain-fall (inches) or melted snow.	Character of day.
		Mean daily.	Maximum.	Minimum.				
1878.								
October 16 . .	29.851	73.7	79	65	52.7	S.	.00	Cloudy.
" 17 . .	29.980	54.0	74	50	58.0	W.	1.11	Fair.
" 18 . .	30.105	44.2	50	41	55.3	W.	———	Fair.
" 19 . .	30.148	47.5	56	40	55.3	W.	.00	Clear.
" 20 . .	30.054	51.7	65	40	49.3	S. E.	.00	Clear.
" 21 . .	29.991	59.5	71	47	53.0	S.	.00	Clear.
" 22 . .	29.973	44.5	59	38	72.3	N. W.	.34	Cloudy.
" 23 . .	30.001	48.0	59	36	57.0	S. W.	.00	Clear.
" 24 . .	30.103	58.2	71	46	49.0	S.	.00	Clear.
" 25 . .	30.150	62.7	73	50	55.7	S. W.	.00	Clear.
" 26 . .	30.131	61.2	72	54	66.7	W.	———	Cloudy.
" 27 . .	30.374	37.2	55	34	63.7	N. W.	.14	Fair.
" 28 . .	30.240	39.0	45	27	44.0	E.	.00	Clear.
" 29 . .	29.958	44.0	51	34	61.3	N. E.	.09	Cloudy.
" 30 . .	29.989	44.7	53	40	53.7	S. W.	.03	Cloudy.
" 31 . .	30.295	36.7	41	32	50.7	W.	———	Fair.

NOVEMBER, 1878.

1878.								
November 1 .	30.219	43.7	52	30	42.3	S.	.00	Clear.
" 2 .	30.187	51.5	62	43	43.0	S. W.	.00	Clear.
" 3 .	30.362	45.0	54	35	57.3	N.	.00	Clear.
" 4 .	30.322	44.7	54	36	55.0	N.	.00	Clear.
" 5 .	30.168	49.7	59	35	45.3	S.	.00	Clear.
" 6 .	29.952	61.7	72	50	50.3	S. W.	.00	Fair.
" 7 .	30.057	50.2	61	43	68.0	N. W.	.03	Fair.
" 8 .	30.205	50.2	54	38	68.0	N. W.	.00	Clear.
" 9 .	30.209	47.7	53	42	54.7	N. E.	.00	Clear.
" 10 .	29.961	47.7	55	38	62.3	S. E.	.00	Cloudy.
" 11 .	29.725	53.0	57	49	73.3	W.	.39	Cloudy.
" 12 .	29.943	48.7	55	45	53.3	W.	———	Fair.
" 13 .	30.103	48.7	58	44	62.3	N.	.00	Clear.
" 14 .	30.310	43.7	53	37	49.0	N. E.	.00	Fair.
" 15 .	30.079	51.7	57	39	53.7	N. E.	———	Cloudy.
" 16 .	30.018	55.0	57	48	82.7	S. E.	1.10	Cloudy.
" 17 .	30.129	51.7	55	49	75.0	S. W.	———	Cloudy.
" 18 .	30.103	48.7	54	43	78.3	N.	.00	Fair.
" 19 .	29.821	48.7	57	37	77.0	S.	.00	Clear.
" 20 .	29.799	49.0	54	43	64.3	S.	.00	Cloudy.

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* Rain-fall marked (———); too small to measure.

REPORTS OF AGRICULTURAL AND HORTICULTURAL SOCIETIES, AND COUNTY FAIR ASSOCIATIONS.

*KENTUCKY HORTICULTURAL SOCIETY.

EMINENCE, KY., January 15, 16, and 17, 1878.

Upon the invitation of Dr. L. E. Brown, and Grange at Eminence, the Executive Committee selected that as the place of holding the annual meeting of the Society. Eminence is on the Louisville and Lexington Railroad, in Henry county, a tolerably new and clean place of about twelve hundred inhabitants. It is eminent for the intelligence and generous hospitality of its people, a fact to which all the members of the Society can testify; it is eminent for its schools, and its wool-growers and its fine horses; besides which, it is on an eminence. It is about five hundred feet above Louisville, and during the last cold snap, when the thermometers all had a general crookedness, the lowest at Eminence was two degrees above, while at Shelbyville, only twelve miles distant, it stood twenty-four degrees below. In and around the town, and within a stone's throw of each other, head streams flowing in four different directions to the Ohio—Salt and Kentucky rivers and Floyd's Fork. Its high altitude, and exemption from severe frosts in winter and spring, its accessibilities to market, denote that in a few years it will become a fruit point of considerable importance. There are already numerous apple orchards in the vicinity, whose fruits will compare favorably with any grown in the State. Mr. G. King sold the fruit on 800 trees for $1,200, the fruit-purchaser picking and hauling the fruit.

Prof. Zach. F. Smith has only failed once in seven years in raising a full crop of grapes. They say that the soil is not adapted to peaches; but we think the people have not tried very hard, or they would overcome the difficulties in the way.

From the attention and interest manifested by the citizens in the proceedings of the Society, we predict that they are awakening to the importance of growing fruits, and, with the energy characteristic of the place, will put to a good use what they have heard.

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* NOTE.—This report was written and furnished by the Secretary of the Society.

The Society was called to order at 11 o'clock, A. M., by President T. J. Key, who delivered the following address:

PRESIDENT'S ADDRESS.

"*To the Members of the Kentucky Horticultural Society:*

"Custom has made it obligatory on the presiding officer to open the annual meeting of our Society with a short address. Our annual meetings have been looked to with much anxiety as occasions for the improvement of the higher emotions of human nature, and heretofore have been sources of great intellectual progress and social enjoyment, and let us strive to make this occasion surpass all former ones.

"The Kentucky State Horticultural Society was incorporated in 1852, and has been an organized and working body from that date up to the present. The majority of the incorporators have served their generation, and passed up into the fruit gardens of Eden; their labors have been placed upon the shoulders of a few earnest, intelligent, and philanthropic horticulturists, a portion of whom have assembled here to-day to exchange ideas and aid each other in disseminating correct knowledge in fruit culture.

"Notwithstanding the comparative indifference of the great masses of the people of our State to a true knowledge of the scientific principles of horticulture, a vast amount of good has been accomplished by the noble band of men and women composing this Society. While the people have not attended the monthly or annual meetings, yet they have read the essays and discussions on the various branches of fruit culture made before this Society, and received many valuable lessons to guide them in their daily toils. A few years since good and indifferent fruits reached the Louisville market in such untidy appearance that they would scarcely pay for their transportation; but such is not the case to-day; and this improvement can be attributed alone to the examples set by the members of this Society.

"But the work of disseminating correct information on horticultural subjects among the masses has been limited, because the State has given no aid in this department of industry. The legislators of Kentucky have thought more of rewarding some partisan, or enriching some officer, than they have of educating the people to grow large, luscious strawberries, juicy, rich peaches, mellow pears, or beautiful and highly flavored apples; but let us hope that this will not longer be the fact. Our sister State, Indiana, annually appropriates $600 as premiums, and for the publication of horticultural information, which is placed in the hands of the State Horticultural Society; Ohio, $1,000; Illinois, $1,500; Kansas, $2,000, and Tennessee and Georgia liberal sums; Kentucky, NOTHING! NOTHING!! Our climate and soils rank Kentucky among the first as a fruit-growing State, yet the annual sales of fruit grown within our borders aggregate only about $2,600,000, while the much younger State of Indiana sells annually from $6,000,000 to $8,000,000 of fruits. This contrast shows what encouragement and aid from that State has accomplished for her people, and that Kentucky loses a revenue of four to six millions per annum.

"I would suggest the propriety of appointing a judicious committee, whose duty it shall be to memorialize the Legislature for an annual appropriation of at least $500, to be expended towards inducing people to grow superior varieties of fruits, rewarding them with premiums, and towards disseminating correct horticultural information among our people. Again, I would urge the importance of organizing County and District Horticultural Societies, which will be local schools of great usefulness, and these should elect delegates, and send up fruit reports to our annual State meetings.

"Now, let us enter cordially, and with the spirit of progress, upon the duties devolving upon us as members of this Society.

"THOS. J. KEY."

SECRETARY'S REPORT.

The Secretary made the following report:

"GENTLEMEN: The proceedings of your last annual meeting were published, according to direction, in the Southern Agriculturist. Since your last annual meeting we have held four *ad interim* meetings; the first in May, in Jefferson county; the second in July, at the farm of Mr. Jas. S. Beatty, in Shelby county; the third at Edwardsville, Indiana, on the farm of Mr. Isaac Fawcett; the fourth in Bullitt county, on the farm of Hon. W. Jeff. Lee. The interest manifested by the surrounding community at all these meetings show that this is, perhaps, the best means of reaching the mass of the fruit-growing community, and it is hoped that you may continue the same. I would suggest that monthly meetings of this kind prove too great a tax on the time of most of the members, and that hereafter they be confined to three during the season. I would also report that the Society has thoroughly revised its fruit list, and now has a correct list of fruits adapted for culture in the State.

"The Secretary was directed to have published two hundred extra copies of each meeting of the Society. I would report the work performed, and they are at the disposal of the Society. There is no society of any importance that does not publish its transactions in pamphlet form. We have given to us at these meetings the experience of the best practical men of the country—an experience which has cost them years of labor and immense sums of money to acquire, and which, if preserved in a form for easy reference, would be of incalculable benefit to our members, and which is, in a great measure, lost to us. It is recommended that measures be taken at this meeting for having them published. All parts of our State are looking with interest on our proceedings, and we have every encouragement to proceed with our work as we are growing in membership, in knowledge, and in influence.

"J. DECKER, *Recording Secretary.*"

The following words of encouragement to the horticulturist were written by one of the first Presidents and most esteemed members of the Kentucky State Horticultural Society:

" *To the Kentucky Horticultural Society:*

"FELLOW-MEMBERS: Regretting my inability to be present with you at this meeting, I cannot let the opportunity pass without expressing my gratification at this effort to spread the influence of the Kentucky Horticultural Society more extensively throughout the State, and at the earnest spirit you have manifested to make the Society an efficient organization for the diffusion of useful information, for the promotion of improved culture, and for the encouragement of social intercourse.

"You have before you a noble work, and one, too, that requires patient labor and unflagging zeal. It is a work that is not confined to the planting and cultivation of fruits, and the fostering of a taste for the cultivation of flowers; but you have to watch the nomenclature of fruits, and correct all errors; you have to guard against insect depredators, and find out the best way to get rid of them. You will find the birds your best friends in the orchard in clearing out the insect pests, and while studying the habits of the insects, you will find one kind preying upon another. Thus we should distinguish between our friends and our enemies, so that, in destroying the one, we should spare the other. So, too, with birds; all insect-devouring birds should be protected, and allowed free access to orchards and gardens without molestation.

"You will have to study the effects of climate, of soil, and of elevation, and recommend such fruits as may be adapted for each location.

Correct and judicious information, properly distributed, in regard to these matters, will save many persons from loss and disappointment; for an orchard lasts many years, and a mistake made in the selection of varieties to plant is not easily remedied. A good orchard is not only a source of pleasure, but of profit; a bad orchard causes both disgust and loss of land, of labor, and of temper. Hence the importance of knowing, before planting an orchard, what varieties will not suit the location.

"Besides these advantages to be derived from the successful and practical operations of your Society, you will achieve even a greater blessing to our fellow-citizens, if your example and teachings should enlist a greater interest upon the part of our young men in rural and horticultural pursuits. The tempting allurements of a city life have drawn too many away from a quiet and peaceful life in the country; and, with a great majority of persons, the change from the country to the city has been very disastrous, indeed, to their prosperity, their health, and their morals.

"It is your duty, then, to create a taste for country pursuits, and teach the people how to adorn and beautify each country home and its surroundings in so attractive a way that the children will not wish to leave it when they have grown up. Our children are the fruits of our lives, and to succeed in clustering them around us in our old age it is necessary that we should make our homes pleasant and full of attraction and agreeable anticipation. A love for the cultivation of fruits and flowers implies a love for home. A home adorned by the labor of our own hands awakens within our affections the highest pleasure and the most lasting interest. Such homes your Society are to create by stimulating and educating the people in the work; and you can fill these homes, too, with a more refined and a purer-minded and a happier class of noble men and lovely women than can be found in any circle of city society.

"It may be said that no one can engage in any life pursuit from mere sentiment, however much they may love the occupation. The pursuit must return a reasonable and a certain profit for the labor and attention given it, as well as upon the capital invested in it. This horticulture will do, as many experienced and practical men engaged in it as a business will tell you; but it requires good judgment, thorough knowledge, and hard work. In these requirements for success, horticulture does not differ from any other avocation. If one can restrain that inordinate desire to make money fast, which is the greatest delusion of our age, he will find horticulture fully as profitable in a series of years as any business he could engage in.

"The horticulturist is independent of all commercial disasters, labor strikes, and financial changes. He is dependent only upon that kind Providence who sends the rain and the dew as blessings upon the earth, and who rewards the labor of the husbandman with teeming crops and a plenteous harvest.

"Revolutions, however, are steadily moving onward in all the affairs of life, and advances, improvements, and changes are now going on both in agriculture and horticulture. The means of transportation have become so great that all the markets of the world are within reach of the products of the Ohio Valley; and, by the introduction of refrigerator cars, ripe fruits, and even fresh meats, can be carried thousands of miles in perfect condition, all fresh and sweet.

"Here, then, is an assurance of a ready market, which was not the case twenty years ago; and these facilities for shipment to distant markets are every year becoming more and more extended, so that no one need fear any difficulty in the sale of really choice fruits at paying prices. The business of horticulture, therefore, can be enlarged to an extent heretofore unprecedented; for the new processes of canning, or drying by heated air, will enable growers to save all surplus fruits to be sold for winter use. Indeed, the only limitations that can restrict the growth of fruits in Kentucky are the natural obstacles imposed by soil and climate. The character of soil, and the elevation of each locality, can be ascertained through the Geological Survey that is now progressing under Prof. Shaler and his assistants.

"The information thus obtained, together with the report of the condition of growing crops, and all annual statistics of the agricultural, horticultural, and industrial interests of the State, are to be regularly spread before the people by the Commissioner of Agriculture. The establishment of the Bureau of Agriculture is a new thing in Kentucky, and its immense influence in promoting the prosperity of the people and causing the profitable use of the dormant mineral and other resources of the State, is not fully appreciated even by the most sanguine enthusiast. The State of Georgia has spent $15,000 per annum upon its Agricultural Bureau, and saved thereby millions of dollars to the people. Tennessee expends $10,000 a year upon a similar Bureau, and by its publications induced some English capitalist to invest two and a half million dollars in land, and bring five hundred skilled workmen to the State; and this is only one instance out of many that are known in which capital and population were brought to Tennessee by the publications made by the Agricultural Commissioner. The State of Kentucky has not yet fully organized its Bureau. It only pays about $1,200 per annum for its support. When Kentucky contributes $15,000 a year to its Agricultural Bureau, and as much more to the prosecution of the Geological Survey, then in a few years fruit lands will be doubled in value, and the population will increase two-fold. This Agricultural Bureau can be made of the greatest service to the Kentucky Horticultural Society, and by co-operating together in a common cause the influence and benefits of the Society can be extended all over the State.

"Apologizing for the length of this communication, and wishing you all a pleasant and interesting meeting, I remain yours most respectfully,

"THOS. S. KENNEDY."

The above address of our late President, Thos. S. Kennedy, was sent to the Kentucky Horticultural Society, at its meeting in July last. At this July meeting a "*Revision of the Fruit List of the State*" was made, and the following varieties were recommended:

Apples — Summer.— Early Harvest, Summer King, Benoni, Sweet Bough, Summer Pearmain, Golden Sweet, Chenango Strawberry, Maiden's Blush, Porter.

Fall.—Jonathan, Fall Queen, Penn, Red Streak, Rambo; northern part of State, Mary Womack, where tested.

Winter.—Ben. Davis, Lady Finger, Lansingburg, Rome Beauty, Janet, Smith's Cider, Wine Sap, Shockley (for Southern Kentucky), Red Limbertwig (for Southern Kentucky), Doctor Walker, new and promising, Ensinger's Nonesuch, new and promising.

Cider.—Hewe's Virginia Crab, Red Crab, Heike's Crab.

Jelly.—Transcendent.

Pears.—Doyenne, de Ete, Chambers, Bartlett, Beurre Gifford, Tyson, Clapp's Favorite, promises well; Belle Lucrative (dwarf), Duchess d'Angouleme (dwarf), Louise Bonne d'Jersey (dwarf), Flemish Beauty, Howell, White Doyenne, Swan's Orange, Sheldon, Seckle, Beurre de'Anjou, Buffum, Beurre Clairgeau, promises well, Lawrence.

Peaches.— Early Troth, Tillotson, Early York, Vanzant's Superb, Grand, Admirable, Heath, Cling, Smock's Late, Chinese Cling, Red Heath, Smock's Free, Old Mixon Cling, Old Mixon Free, Heath Free, Cooper's Mammoth, Stump the World, Tippecanoe.

Apricots.—Early Golden, Moorpark, Peach.

Cherries.—Belle d'Choisy, Early Purple Guigne, Gov. Wood, May Duke, English Morello, Black Tartarian, Black Earle, Early Richmond, Napoleon Biggarreau, Yellow Spanish, Elton.

Plums.—Lombard, Early Union, Wild Goose.

Grapes.—Concord, Norton's Virginia, Venango, Martha, Delaware, Rogers, 4–9, 15–19, Perkins, Ives, Diana.

Strawberries.—Wilson, Monarch of the West, Chas. Downing, Kentucky, Downer's Prolific, Black Defiance, promises well.

Currants.—Red Dutch, Versailles, Cherry, White Grape.

Raspberries — Black.— Duncan or Kentucky, Doolittle, Mammoth Cluster, Miami. *Red.*—Turner, very promising; Brandywine, for trial.

Blackberries.—Wilson Early, Missouri Mammoth.

Gooseberries.—Houghton, Downing.

The Fruit Committee reported as follows:

"We, the Fruit Committee, would report, that at the May meeting at Mr. J. Decker's, in Jefferson county, we examined the following varieties of strawberries in bearing, viz: Wilson, Charles Downing, Boyden 30, Champion, Black Defiance, and the Monarch of the West. The Black Defiance was remarkably fine and of excellent flavor; the Monarch was also good. The others had suffered extremely from a late frost and drought, and did not appear to as good advantage as they otherwise might.

"At Mr. Beatty's, in July, there was considerable fruit, but it was not classified, and your committee could make no report.

"At Mr. Fawcett's, in August, there was much fine fruit, of both peaches and apples, shown by Mr. Fawcett and his neighbors, a list of which you will find in the Secretary's report. Mr. Fawcett's farm was in a superb condition, although we thought it below his standard.

"At Mr. Lee's, in September, there was a splendid display of fruits, consisting of thirty varieties of apples, ten of pears, seven of peaches, and two of plums, a full list of which will be found in report of the meeting. The orchards in all parts of the country visited were in bad condition—wanting in cultivation and training: this caused partly by the failure of fruit crops for several years, and mostly from want of knowledge of the proper treatment an orchard should receive. Another great error is in planting too many varieties, many of which are not adapted to this climate; in nine tenths of the orchards in the State, only a few of the trees are profitable from this cause.

"At the present time we would report the peaches in many localities of the State entirely killed, while in others there is plenty left for a full crop. The other fruits appear uninjured as yet.

"J. S. Beatty,
"J. Decker,
"*Fruit Committee.*"

The *Ad Interim* Committee submitted the following report:

"MR. PRESIDENT: Your *Ad Interim* Committee beg leave to submit this their annual report. We are gratified to be able to present a very favorable report in the advancement in horticultural interests. Your Committee held four very successful meetings among the fields of horticulture during the past summer. There was a general response to the call by the people, who seemed much interested in the subject.

"It is our conviction that the work to be done by your Society, to place our State, horticulturally, on anything like even ground with many other States that are our juniors, is great. There must be a revival; we must enlist new members to take the places of veterans that have passed from among us, or are on the retired list.

"This work can be done. We must set ourselves to work with a vim and energy that insures no failure. There are already signs of this stirring up visible. There were quite a number of new members added to our Society during the year, and to us it seems quite clear that many others will be enrolled ere another twelve months have passed, if we but do our duty—our whole duty. In this work there must be no drones to clog our progress; earnest, faithful, and zealous workers are what we need, and what we must have, to be successful. But this work cannot be carried on by this work of love alone, without its becoming onerous to those that have been so faithful and constant. Besides, the work must necessarily progress very slowly; while if the Society had the funds necessary to put in book form all the valuable papers and discussions on the various subjects pertaining to horticulture, that they may be scattered throughout the State, the work could be advanced rapidly, and in a few years, at most, we would have the pleasure of seeing the meetings of our Society attended with more interest and animation, and the country dotted with orchards and vineyards, borne down with luscious fruits, where to-day the knotty, scrubby tree and vine are encumbering the ground, and the fruit produced on them, if any, is not fit to be classed among fruits; being of such poor quality that a pig educated to the use of good fruit would pass it by in disgust.

"The question arises, how shall the money to do this work be obtained? We see no source except by State aid. Your Society appealed to the Legislature two years ago for such aid. We can hardly say that the appeal was entirely unsuccessful in one sense, yet in the true sense it was a total failure. This to some minds may seem paradoxical, nevertheless it is true. If the appropriation known as the Agricultural and Horticultural and Immigration Aid Fund had been appropriately applied, it would have been sufficient to have advanced the arts of agriculture and horticulture to the full extent of our anticipations. We are sorry to have to say that the reports made by the Commissioner on horticultural topics are very meager and unsatisfactory. Many of the suggestions are calculated to mislead the inexperienced, and no good pomologist could indorse in full the lists of fruits that have been recommended from time to time by him.

"We recommend to the Society that the appeal be renewed, asking for an appropriation by the Legislature now in session to put the reports of the Society in book form—the funds not to be squandered on high-salaried officers. The money should be put direct in the custody of the Society, and applied to the object for which it is given. The work should be let to the lowest and best bidder, and no money paid on the work until sample copies are examined and approved by a publishing committee. We suggest that a committee be appointed to go to Frankfort in the interest of this Society, asking the Legislature to appropriate from the State Treasury a sum sufficient to do the aforesaid work. We think that the better way to proceed will be to draw up a proper memorial, setting forth our wishes, and each member and friend of this Society take a copy and get signers throughout the State. Let us send ten, twenty, or fifty thousand names as signers to our petition; these several papers to be forwarded to the Chairman of the Committee as soon as the canvass is thoroughly made.

"These are suggestions only; we subimt them for your consideration and proper disposal of the subject.

TREASURER'S REPORT.

Credit.

January 15, 1878, cash on hand from last year		$70 89
Membership fees		14 00
Total		$84 80

Debit.

To cash for reporting at annual meeting, 1876	$15 00	
Books and cards	77	
Postage	50	
Sawdust for exhibition room	2 00	
Total expenses		18 25
Balance on hand		$66 54

"J. S. BEATTY, *Treasurer.*"

Dr. W. W. Goldsmith, from Committee on Flowers, reported an increased interest in the cultivation; florists were enlarging their houses. The demand was increasing for parties, funerals, &c., but the greatest demand was for home adornment. The rich were planting largely—the cottager was using this means to beautify his home, and even those who only had one room were not content without a few flowers.

Miss Rosa Goldsmith read a poetical report on the same subject, for which the Society gave her a vote of thanks, and which will be published with the other essays.

The following resolution was adopted:

Resolved, That the Legislature of Kentucky be petitioned to require the assessors of each county, in addition to the present statistical report, to take the number of acres each in apples, peaches, pears, plums, cherries, grapes, strawberries, and raspberries, and the number of bushels of each kind produced annually.

The Society then discussed the question, "Are bees Injurious to Fruits?"

AFTERNOON SESSION.

A paper by William H. Sisson, Geneva, Kentucky, on the *Liquidamber* was read and discussed.

Dr. W. W. Goldsmith read a paper on the "Color of Plants."

A paper on "Pear Blight," by Dr. S. A. Foss, Pleasant Ridge Park, was read, and the following committee appointed to investigate the subject: Drs. Foss, Goldsmith, and Hawkins.

A paper on "The Best Strawberries for 1877," by A. D. Webb, of Bowling Green, Kentucky, was then read.

WEDNESDAY MORNING.

The following petition to the Legislature was adopted, and Prof. Zach. F. Smith, of Eminence, appointed to present the same:

"WHEREAS, The fruit interest of Kentucky has become one of the leading industries of the State, and immense sums are spent yearly in the purchase of trees and plants by the farmers of the State, and there are many varieties that are entirely unsuited for cultivation by want of their adaptability to the soil and climate. It becomes necessary that the proper information as to what will be of benefit and advantage should be disseminated among said farmers, thereby saving to them, not only the money which is expended uselessly, but the time it requires to bring said fruits into bearing; and believing that the Kentucky State Horticultural Society is the proper and best medium for the collection of said knowledge, and in the pursuit thereof should be granted such aid from the State as is given by the States of Indiana, Illinois, and Ohio; therefore,

"*Resolved*, That the honorable Legislature of Kentucky be, and is hereby, petitioned to grant the said Horticultural Society the sum of one thousand dollars annually, to be used by said Society in publishing their transactions, and in such manner as the Executive Committee may direct."

The discussion of strawberries occupied the balance of the morning session.

AFTERNOON SESSION.

A paper on "Destroying the Peach Borer," by Mark Coffin, Milton, Kentucky, was read.

Mrs. W. J. Lee, of Bullitt county, read a paper on "Fruit Preserving and Jelly Making."

A discussion on securing a more "Hardy Race of Peaches" took place.

EVENING SESSION.

J. W. Walker gave a list of "Apples for Family Use," and the Society went through the list of fruits.

J. S. Beatty read a paper on the importance of "Planting only a few Varieties."

THURSDAY—MORNING SESSION.

Pruning was taken up and discussed by the Society.

A paper, "American Forestry," by Dr. John A. Warder, of Ohio, was read, and a vote of thanks given to the author.

S. L. Gaar, of Anchorage, read a paper on "Lawn and Ornamental Tree Planting."

The Committee on Fruits reported an apple by Prof. Todd, on the table, which they were unable to identify, but which was large and very fine; also a seedling, by J. W. Crabb, with faint stripes and large grey dots on the surface; flavor very good, and recommended that it be called Crabb's Seedling.

County and District Societies.—President Key introduced the following resolution in regard to the formation of District Horticultural Societies, which was adopted:

"*Resolved*, That the Kentucky State Horticultural Society earnestly requests the organization of horticultural societies in each county in the

State, and to send up delegates to the annual meeting of the State Society, to be held at Eminence in January, 1879; and where the horticulturists are not organized, we request the Patrons of Husbandry, and fruit-growers also, to send delegates, accompanied by reports on fruits, bringing samples of fruits."

Forestry.—The following resolutions on American Forestry were adopted, and copies of same were directed to be forwarded to the Hons. A. Willis, Blackburn, and J. P. Knott, members of Congress from Kentucky:

"WHEREAS, The members of the Kentucky State Horticultural Society fully recognize the fact that the preservation and renewal of our forests is a matter of vital importance to the future interests of this nation; and as the subject has been recommended to the attention of Congress by the President of the United States in his recent annual message, in furtherance of this great and important subject, it is hereby

"*Resolved,* That we heartily indorse the recommendation of the memorial of the Committee of the American Nurserymen's Association, and commend it to the careful consideration of the Congress of the United States; and that we urge the passage of the bill No. 1218 of the House of Representatives."

New Members.—The following officers were elected for the ensuing year:

President—T. J. Key, Louisville, Kentucky.

Vice Presidents—L. E. Brown, Eminence; A. D. Webb, Bowling Green; I. Fawcett, Edwardsville, Indiana.

Treasurer—J. S. Beatty, Simpsonville, Kentucky.

Corresponding Secretary—Thomas S. Kennedy, Fair Grounds, Kentucky.

Recording Secretary—J. Decker, Fern Creek, Kentucky.

Executive Committee—Prof. Z. F. Smith, Eminence; W. W. Goldsmith, Louisville; W. J. Lee, Pitts Point; H. S. Duncan, Louisville, Kentucky.

Ad Interim Committee—J. S. Beatty, A. D. Webb, I. Fawcett.

Fruit Committee—W. J. Lee, S. L. Gaar, J. W. Walker, A. D. Webb, J. S. Beatty.

The following members were received and renewed:

L. E. Brown, E. C. Bright, I. M. Crabb, H. S. Duncan, W. W. Goldsmith, W. S. Helm, T. J. Key, T. S. Kennedy, I. Strong, J. W. Walker, J. S. Beatty, Thomas Buford, J. P. Cotton, J. Decker, S. L. Gaar, W. J. Lee, G. King, D. N. Porter, Z. F. Smith, E. F. Waide.

The papers and discussions will be published in regular order; after their publication they will be issued in pamphlet form. All paid-up members will receive a copy; others who desire them can remit their annual dues to the Secretary, and any one will be entitled to membership and a copy on sending one dollar.

J. DECKER,
Recording Secretary, Fern Creek, Kentucky.

ESSAY ON THE CULTURE OF FLOWERS—BY MISS ROSA GOLDSMITH.

I fain an apology would make,
Which is not alone for appearance sake—
But for many good reasons, if they could be told:
The first I will give, if it be not too bold.

It was only last night that I heard father say,
That possibly I might be here to-day;
And as I was expected an essay to write,
Such news was enough to put me in a fright.

The subject proposed, "The Culture of Flowers."
Now an excellent essay takes how many hours?
A few, at least, your thoughts to collect,
Therefore a poor one you now may expect.

You may go to the Gardener's Monthly to-day,
Or the Horticulturist I should say—
And find more about the culture of flowers
Than I could tell you in twenty-four hours.

I know the culture of flowers here
Has been increasing year by year;
With prices reduced so all can buy;
And all can raise them if they try.

To be sure, they take both time and care,
Of which we all have some to spare;
But do they not our pains repay
With beauty and fragrance day by day?

And I am sure you will always find
That flowers do elevate the mind.
Somewhere the idea has been given,
That flowers were messengers from heaven.

And it does seem so, for do they not cheer
Our pathway often when all else is drear?
And does not many a flower recall
Places and persons dear to us all?

I often walk in my garden now,
And look on my flowerets sweet,

And wonder how often, and when and how,
  Their beauty I shall greet.

The greatest lesson to me they tell,
  For many to me they say,
Is to do my duty at present well,
  As I, like them, pass away.

As says the poet—

In all places, then, and in all seasons,
  Flowers expand their light and soul like wings,
Teaching us by most persuasive reasons,
  How akin they are to human things.

Bright and glorious in that revelation,
  Written all over this great world of ours,
Making evident our own creation,
  In these stars of earth, these golden flowers.

And with childlike, credulous affection,
  We behold their tender buds expand;
Emblems of our own great resurrection,
  Emblems of the bright and better land.

Are Bees Injurious to Fruits? Discussion.—Dr. Brown. Said he was satisfied that bees were injurious to fruits; that he had a large lot of Concord grapes, and wishing them to get fully ripe, he allowed them to remain on the vine; when he went to gather the grapes the bees had destroyed them.

H. S. Duncan. Said they will not cut the skin, but after it is punctured they will destroy it.

W. W. Goldsmith. Says they have not the organs to puncture fruit.

President Key. Quoted from various sources to show that bees were perfectly harmless; that they had no power to puncture a sound grape or peach, and were a benefit to fruit, and could hardly be coaxed to eat anything but lawful property.

J. W. Beatty. Had seen the bees swarming around the fruit stands in such numbers that the dealers had to protect their fruit with netting, to keep it from being destroyed.

J. Decker. Had all his life heard it said that bees could not injure fruits; had always kept bees, and never saw an extra fine specimen of fruit allowed to become fully ripe on the tree that the bees were not the first to find it. When it is remembered that ripe fruits have always very delicate skins, and are liable to burst the skin, but would remain for days in good condition were it not for bees, it will be seen how they can injure fruits.

Dr. Brown. Said the Italian bees were larger than the black, and he thought they could puncture fruits.

W. J. Lee. Asked could apiculture and horticulture be conducted profitably together? A majority of the members thought not.

S. L. Gaar. Thought they might, as we gather many fruits in a green state, and ripen under shelter.

W. J. Lee. Thinks it would depend on the amount of food otherwise furnished.

Dr. Brown. Thinks if they were properly fed it might make a difference, and they would not disturb the fruits.

H. S. Duncan. Did not think a person could make both pursuits profitable.

Drane. Thinks the bee of more advantage than harm to the fruit-grower; they are not provided with implements to bite with; the fruit must first be cracked before the bee can injure it; however, he is a natural pirate, and will appropriate anything that comes in his way. He is of great advantage in fertilizing flowers, and should be allowed something for his work.

AFTERNOON SESSION.

H. S. Duncan read a paper on the "Sale of Fruits."

Grapes were then taken up.

The Secretary was allowed $20 for reporting the proceedings, and instructed to publish the same.

Two hundred extra copies of each publication were ordered, and the publisher allowed $4 each issue for them.

Mr. Beatty asked for a strawberry exhibition at Shelbyville, which was adopted.

Mr. I. Strong invited the Society to meet in the Fern creek neighborhood in September. Adopted.

On invitation of the citizens of Eminence, it was resolved to hold the next annual meeting at that place January 14, 1879.

The following was adopted by a rising vote:

Resolved, That we tender to the people of Eminence our thanks for their generous hospitality, and the attention and interest manifested in this meeting.

The Liquidamber—Essay by Will. A. Sisson, Geneva, Kentucky.—This tree, known to botanists as the *Liquidamber styraciflua*, is a member of the witch hazel family; its name alludes to the fragrant teretinthine juice or balsam, which exudes from the trunk when scarified, and soon forms a thick gum. On this account it is familiarly known to country juveniles as the sweet gum tree, the gum being much sought after by the little folks for chewing. The gum has also healing qualities, and makes a salve very healing to sores and irritations.

The tree is thinly disseminated throughout the United States, but especially in the South. It is the only one of its species in this country. Wet, low ground, adjacent to creeks, in the valleys of the Ohio and Mississippi, seem to be its most congenial home. Almost every flat in this section is timbered with it; in many instances producing specimens four to five feet in diameter, and sixty to seventy feet to the first limbs.

The bark on the trunk is deep-seamed, the ridges being rugged and scaly, and of a squirrel-grey color (black points, however, is no sign of a thorough-bred). The limbs on most of the small trees, and those growing in open fields, have broad corky ridges of bark resembling fins, and when the tree is stripped of its foliage gives it quite a picturesque appearance. The bark, when boiled down to a strong ooze and mixed with fresh milk, is a specific for dysentery. The leaves are smooth and glossy, five to seven deep lobes; their triangular lobes pointed and beset with glandular teeth; when crushed between the hands, they emit a very pleasant odor.

"Touched by the hand of coming snow," the Liquidamber puts on a robe of the most gorgeous hue; deepest scarlet and palest gold intermingled with shades of every dye, their glossy surfaces reflecting back the sun's bright rays. Arrayed in its autumn gown, preparatory to the long night of winter, it is unsurpassed in beauty by any of its rivals of the lawn or roadside.

The flower is not conspicuous, being small green heads on a slender stem; they appear with the earliest leaves, and are in full bloom ere the leaves are grown. The fruit is a globular compact bell or burr (somewhat resembling a small chestnut, only it is toothed, instead of having sharp spikes), suspended by a slender pedicil, and is composed of numerous capsules, each having one or two triangular-shaped seed, villouse on the edges, which serve as wings.

Authorities agree that but few of the seed come to maturity; and from the comparatively few scions to be seen, the conclusion is correct. When the roots protrude above ground they often throw out sprouts The balls hang on long after the rough winds of autumn have denuded it of its foliage, often until spring. They are used to ornament baskets and boxes for the yard. When allowed sufficient room to grow *ad libitum,* it retains its lower limbs, and grows in a sugar-loaf shape.

As to its capacity for growing, it is about as fast as the tulip tree. As it has studiously been avoided in the collections for street and park adornment, and is too common for the farmer to notice, I cannot say how it will succeed transplanted; but as most of its roots are lateral, I should suppose it would live; and lastly, as adapted to timber purposes, it is fast coming into favor, being better liked as it is more used. The grain is fine, and the color is good, and for all inside work is better than oak or poplar, not rusting off the nails like the former, and holding them better than the latter; and when well seasoned, does not swell and shrink during every change of the weather, which adds much to its value as flooring or siding.

The kind commonly known as yellow gum, having but little sap, will last equal to any of timber in fencing.

Millions of feet are annually cut into lumber in this county, yet thousands of acres are still waiting the woodman's axe, dotted here and there with numerous fine specimens of the Liquidamber, whose lofty crests tower amid the branches of the old forest kings.

Discussion.—Decker. Had seen it used for timber for inside work, and it was excellent; had built a picket fence of it twelve years ago, and the fence was good yet. Care should be taken in seasoning, as it was disposed to warp, unless piled and weighted.

Beatty. Had sawed many thousand feet in Bullitt county; it was generally so much windshaken that good lumber could not be made out of it. It has beautiful foliage, and makes a splendid growth.

Helm. I have one that is the most beautiful tree on my farm. It stands in a field, and there is no tree on the place that can compare with it in beauty.

Duncan. Thinks it is one of the most beautiful of all trees. He has never succeeded in getting it to grow, when taken from the woods. When very small it must be placed in the nursery, and from there it is easily transplanted.

Gaar. For an ornamental tree, the sour gum is to be preferred, as it is much superior. It has a beautiful scarlet foliage, and, all in all, is a much superior tree. He admits that the sweet gum is a nice tree, and is worthy of more attention than is now given it.

"*Pear Blight—Essay by Dr. S. A. Foss.*—Sickness and a death in my family since my appointment to prepare a paper on Pear Blight and the latest remedies, has prevented me from formulating all the facts I could obtain on the subject.

"The importance of Pear Blight cannot be overestimated. The obscurity in which it is veiled is equal to its importance; in fact, the Scotchman who said 'When he who speaks dinna kens of what he speaks, and he who hears dinna kens of what the speaker speaks, then that is metaphysics,' very aptly represents the sum of my knowledge or rather ignorance of Pear Blight. I have heard innumerable theories as to cause, prevention, and cure. I have whittled a pear tree, dead of blight, into thirty pieces, and passed it under the microscope, leaves and all, and was no wiser about the cause of blight. I have heard men dogmatically assert that it was the effect of cold on the immature wood; others, that it was the heat scalding the sap as it flowed through the trunk and branches, &c.

"Notwithstanding the above deplorable statements, I do not propose to give up the investigation. I am now experimenting with wood-ashes, Green river coal ashes, and salt, separately and combined; using a quart of ashes to a pint of salt, scattered over the surface of the ground, near the trunk of the tree, when they are combined; and when used separately, one quart of either variety of ashes to a tree, or one pint of salt to a tree. My land, on analysis, shows deficiency of salt and alkalies. I would suggest to the Society that a volunteer or volunteers be called for a sort of 'Forlorn Hope' Committee, to give us a resume of absolute knowledge on Pear Blight; its cause, prevention, and cure, at our next annual meeting. S. A. Foss.

"Pleasure Ridge Park, Kentucky."

DISCUSSION.

Gaar. There has been a great many remedies proposed for blight by a great many persons; they all professed to know how to prevent it. When a tree is attacked in the body there is no cure; when attacked in the limbs, there is. I look on it as an epidemic that cannot be cured. Some varieties appear more susceptible to its attacks than others, and those are not worth cultivating at this day. When the limbs are attacked, you can sometimes save the tree by cutting off below the affected parts.

J. W. Walker. Don't believe there ever was a tree saved. I have cut off the limbs, and it stopped; but it would have stopped if I had never cut at all. Sometimes it will stop when it gets so far, and sometimes not at all.

Decker. The editor of the "Gardeners' Monthly" recommends pure linseed oil as a preventive and remedy. He says it is a fungus, and can be cured.

Goldsmith. The fungus sphere is a seed that germinates differently, or according to the conditions in which it is placed. The want of proper food may cause this seed to die as any other. The fungus is the primary cause. The conditions surrounding is the reason why some varieties fall easier than others; a more delicate organism may cause it to take hold easier. I find soils have much to do with it—rich soil causing a strong unripened growth of wood, which presents the proper conditions for the germination of the fungi; while poor soils make a well ripened mature wood, which do not have those conditions. I can understand why oil will prevent blight, as it coats the tree and keeps the spores from germinating. As the fungi germinates, it extends under the bark and ramifies, until it has possession of the whole tree, and it dies.

Beatty. I consider the remedy impracticable; so many attacks are in the small limbs, where you cannot apply the oil. I don't think soil has anything to do with it.

Gaar. Why is it that some varieties are killed and others only slightly affected? I know it is a derangement of the sap, and that it comes periodically.

Goldsmith. It is dependent on different causes that we cannot understand, and, like all epidemics, comes at different times. The attacks at the top are carried down by the flow of the sap. The constitution of the tree has much to do in resisting the attacks. All fruits vary according to the local conditions. Corn, on some soils, is not as nourishing as on others, so with blight Trees grown on some soils are more liable to be attacked than on others. It strikes where the seed falls.

Strong. I lost five trees last year, and, on examination, I found blotches on the bark. I split the bark, and the trees recovered.

Beatty. Your trees were hide-bound.

Goldsmith. Anything that impairs the vitality of the tree will render it more liable to disease.

Walker. It has been here for forty years, and unless nature throws it off, it will remain.

Goldsmith. After cutting off branches affected with blight, they should be burned immediately to prevent further spread of the disease.

Duncan. I concur in that.

Key. In regard to the ashes spoken of by Dr. Foss, the chemical effect will be to render, by the action of the potash, the silica in the soil soluble, and thereby harden the bark, and cause the tree to be better able to resist the attacks of the fungi.

Walker. Don't believe you will ever find out any remedy. I never have lost but one tree.

Duncan. Thinks a wise Providence has given us an intellect, and if we persevere we will succeed at last.

THE BEST STRAWBERRY FOR 1877—ESSAY BY A. D. WEBB, OF BOWLING GREEN.

"*Mr. President and Members of the Kentucky Horticultural Society:*

"In compliance with your request that I should prepare for this, the annual meeting of our Society, an essay on the "Best Varieties of Strawberries for 1877," I presume the object is that I should name the varieties that fruited on my grounds the past year, and then designate the varieties that proved the most satisfactory, in order that others possessing the same varieties can compare notes as to results. It being a conceded fact that all varieties do not succeed equally well in all soils and in all localities, hence the importance of giving the character of soil in speaking of the result of any named variety. My soil might be termed rather a sandy loam, with clay foundation, natural drainage good.

"During 1877 I fruited on my grounds the following varieties, viz:

"Wilson's Albany, Green Prolific, Champion, Black Defiance, Lady Finger, Boyden's 30, Col. Cheney, Prouty's Seedling, Cumberland Triumph, Springdale, Sterling, Norman (new), Kentucky Champion (new), Charles Downing, Kentucky, Monarch of the West; also about 70 new seedlings of my own, of which I don't care to speak until I test them another year.

"All the above named varieties fruited with me under the most favorable circumstances, except perhaps the Black Defiance, which I think was materially injured by too much rain while in bloom. Only the first blooms matured their fruit; the late blooms, just expanding during some heavy rains, were all blasted.

"After having fruited nearly all the prominent varieties that have been introduced in the last ten or fifteen years, I now place the Monarch of the West at the head of my list, as being the most satisfactory variety that fruited with me in 1877, or any previous year. The plant is unusually strong and vigorous; does not seem to be affected by any kind of weather, either wet, dry, cold, or hot; medium early; very prolific; fruit from large to very large; good flavor, and handsome appearance; fruiting season long; sufficiently firm for near market, even when fully ripe; and if it possessed the firmness of the Wilson, I would unhesitatingly pronounce it, where it will succeed, the most desirable variety for all purposes ever introduced. In short, my judgment is, that it possesses a combination of merits not found in any other variety. For the best results it should be cultivated in hills or thinly matted rows.

"The Charles Downing I place second in my list for satisfactory results. This variety has been so long and familiarly known throughout so vast a territory, that I deem any lengthy comments unnecessary. No variety, except, perhaps, the Wilson, has met with more universal favor East, West, North, and South. While I place this variety second on my list, I deem it indispensable in every collection. It is peculiarly adapted to the wants of the lazy man or careless cultivator, while it appreciates good treatment equal to any; it has given me better results from neglect than any other variety. I have fruited it seven years on the same plat of ground; the last seven years without any cultivation or attention, except to mow the weeds in the fall, and burn off in February. The seventh year, I picked some of as fine berries as I ever did. After giving decent culture, the yield was not so large, as the blue-grass and white clover by this time claimed possession of a portion of the plat; yet I feel well compensated for a few hours' labor in mowing and burning. I will give the result of the fifth year, which was the year after my first mowing, and the only year I kept any record. From one fifth of an acre I marketed 400 quarts, for which I received 25 cents per quart. I kept no account of the amount consumed by the family from this plat; suffice it to say, that we are strawberry-eaters at our house, and have neighbors equally fond of them. I would add that the Charles Downing has succeeded better with me, under all the various modes of culture or non-culture, than any variety I have ever tested, were I not fearful some might be induced to invest in it for a purpose that would not be creditable.

"I would like very much to add Black Defiance to my list; but as I am confined to 1877, and it rather went back on me, I will have to leave it out in the cold for further trial.

"You now have my list for 1877, composed of two varieties. Another favorable fruiting season might bring other varieties to the front, as I have some others that promise well, but require further trial to decide upon their merits."

Discussion.—Beatty. I find that the Wilson is out of fashion; it has had its day. The people want something better, and it is no longer profitable.

Duncan. While I don't favor the Wilson, I don't think it has ever had its equal for shipping.

Gaar. On account of its being such a good shipper and canner, we cannot dispense with it.

Decker. I find that I am compelled to yield to popular opinion, and, to a great extent dispense with the Wilson. In laying it aside, I wish to give it all the honor that is due. It has been the greatest of all strawberries; it has done more than all others to popularize strawberry culture; with generous treatment, it gave a generous yield; with neglect, it would still give something. There never was one dollar spent on it that it did not return two; and in placing it in the background, we feel that we are parting with an old friend, one who has been tried and proven faithful and true; but the public has found out that there are better berries, and, as a commercial grower, I must yield to their tastes. I would, however, recommend that it be retained in all collections.

The Green Prolific was voted worthless by all the members.

Beatty. Spoke highly of the Black Defiance, and said if you want a large berry, and one of the very best flavor, take that.

Decker. Said that it had surprised him. It was vigorous, very early, of the largest size, superior flavor, and if it continued to do as well as it had, he knew of no berry equal to it; the large size and peculiar richness of color would cause it to rank as the very best in any market. It will also remain several days on the vines after coloring in a perfect condition. At present I place it at the head of the list, and would recommend it for trial.

Decker. Said the Champion was productive, but was so sour that he could never get any one to eat it; besides, it was a pistillate variety.

Gaar. Spoke highly of the flavor of the Lady Finger; but it was a sparse bearer, and could not recommend it.

Decker. Said the Boyden 30 was an excellent berry where it succeeded; he had raised some extremely large berries and good crops of this variety, but did not think it could be depended on, and had been informed that it succeeded very well in the Bluegrass Region. Where it does well it is a remarkably large berry, wanting in acids; but some prefer a very sweet berry.

Duncan. Does not like the color. The end has a green tip, and if you wait until colored, it is too soft. The size is very good.

Strong. Said that if mulched well it would ripen perfectly, and present a very fine appearance.

Decker. Said the Col. Cheney was a fine large berry, but was a pistillate, and he would recommend no berry whose flowers were not perfect.

The Prouty Seedling was vigorous, strong, and very productive, but had not yet been tested sufficiently.

The Cumberland Triumph was a very vigorous plant, the berries very large, but was rather soft for a market fruit. The flavor was of the best; would recommend further trial.

The Sterling has proved of no value here.

Duncan. Said the Charles Downing was certainly the lazy man's berry. It was also the best for family use. I have produced more gallons from the same sized piece of ground than from the Wilson.

Gaar. It is a very superior berry, and one which I am much pleased with. It should be in every collection.

Beatty. I have been unfortunate with it, and have never been able to get a berry that was worth anything. I cannot account for it; my plants do not grow, and the berry is little and dwarfy.

Decker. Thinks it one of the metaphysical berries. With extra good treatment, it will not produce well; with neglect, it does excellently. It requires a very strong soil to get it in perfection. It bears better fruit the second year than the first; and thinks if manure was applied to old beds in the fall of each year, there is no telling how long a plantation will last.

Dr. Crutcher. Said he had raised a splendid crop year before last; last year only about half a crop.

Prof. Todd: Strawberries have done finely with me. With the Charles Downing my success has been great. I have produced at the rate of about 100 hills per acre. My culture, after bearing, is to spade up every alternate eighteen inches, and allow the plants to extend over it. I think I can raise strawberries on the same ground for forty years.

Walker. Spoke of the uniformity of size in the Charles Downing; the last berries being as large as the first.

Decker. Spoke of the Kentucky as being a very vigorous, large, misshaped berry, not first-class in flavor, but, on account of its late blooming and ripening, should be recommended.

Gaar. It is an excellent late berry, and is very desirable. We often get a full crop of this when the others are destroyed by frost.

Beatty. The finest berries I ever saw were the Kentucky.

Strong. Said it was an excellent berry.

Decker. He could hardly say more for the Monarch of the West than Mr. Webb had already said, but fully indorsed his statements; probably no other berry has given as much universal satisfaction as this. It has one fault; it does not color when well shaded, and care should be taken not to have the plants too thick in the rows.

Beatty. Said it was extremely vigorous and thrifty, the leaves remaining green long after the other varieties had turned brown.

Walker. Said he was much pleased with it.

Prof. Todd. Spoke highly of the medical qualities of strawberries; said they were valuable for those, if they had nothing else to recommend them. No man would die in strawberry time. If he could manage to live until they ripened, he would put off dying until they were gone.

Prof. Smith. Spoke of the tendency of vines to become barren, and asked how to tell the bearing from the non-bearing vines.

Decker. Stated that he had planted a pistillate variety, and should discard them, and only plant those whose flowers are perfect; besides, in obtaining plants from old beds, you are as likely to get seedlings as the variety sought for. In every plantation many berries rot, and strawberry seeds germinate very easily, and it requires a knowledge of the general character of the plant, and a great deal of care, to keep plantations pure. For this reason it is advisable often to renew beds, and only plant those you know to be pure.

General Culture of Strawberries.—A desire for the members to express their opinion on the culture of strawberries was expressed.

Decker. Said to plant in rows about three feet apart, plants about one foot apart. After planting, pinch off the blossoms the first year. Go over the ground often with a garden rake, taking care not to loosen the plants. Cut off the first three sets of runners as fast as they appear; the balance may be allowed to take root. In the fall, cover with straw or cut corn-stalks, and allow them to remain until after fruiting. In this way strawberries are as easily cultivated as onions or cabbage.

Beatty. I plant in rows; cut off the first two or three runners. When the next appear, I take them and set an equal distance from the rows on both sides. You then have three rows instead of one. Cut off the balance of the runners as fast as they appear, and you have room around each plant, and can easily keep them clean.

Duncan. After trying many plans, I plant in rows, and cut off the runners as fast they appear, and keep the centres well cultivated. In the fall the plants will have extended from six to nine inches; then cover with cut straw to prevent freezing, and let it remain until after fruiting.

The Best Time for Planting.—Beatty. Said early spring.

Decker. When you plant potatoes.

The members all condemned fall planting.

Prof. Smith. Asked the best manure.

Beatty. Cow manure; after that, well-rotted manure from the horse stables.

THE BEST MEANS OF DESTROYING THE PEACH BORER—ESSAY BY MARK COFFIN, MILTON, KENTUCKY.

"*Mr. President and Members of the Kentucky Horticultural Society:*

"It is with no small degree of embarrassment that I attempt to interest, much less instruct, this intelligent body on a subject that should be familiar with all fruit-growers—the Peach Borer. As I am requested to write something in regard to the destruction of that worst of enemies—the Peach Borer—and as I have had considerable experience, both in growing peaches and killing the 'grub,' I will attempt, in my humble manner, to give my views on the subject. In my opinion, the best method of destroying the peach grub is to search about the collar and roots of the tree, and when you find him, stick a sharp-pointed knife in him, and that part of the work is done. But that is not what we want entirely; digging and searching, and picking and poking about the roots of the trees, is too tedious and expensive for the extensive fruit-grower, when there is a cheaper and more expeditious mode of remedying the evil. The fact is, we ought not to let them get into the trees; and it can be avoided, if we take it in time.

"The Peach Borer is the larvæ of a four-winged, steel-colored, wasp-shaped fly, about three fourths of an inch long. The female is rather heavy and sluggish, having a yellow belt around the abdomen; very shy; rarely seen in daytime. The male is more slender, quick motioned, and uniform in color, having two feelers in front much longer than those of the female. The female deposits her minute, whitish egg in the crevices of the bark, at or near the surface of the ground, at night, where it hatches in a short time. The young worm begins to eat right where it hatches; and, as it increases in size and strength, travels around considerably, getting down a little below the surface of the ground, where the bark is tender; and a single worm may be traced around the tree, eating a little here and a little there, leaving small patches of fine dust, resembling fine sawdust, sometimes down to the roots, and will make a journey out on some of the laterals and back again. Still increasing in size, as can be known by his chips being larger, he by this time eats deep into the bark, and finally gets through, and as cold weather approaches eats his way down some distance below the surface of the ground, where he generally remains until warm weather in the spring, when he begins to ascend, still growing larger, and by this time is large enough to do considerable damage to the tree.

"His presence may be readily known by the gum around the collar, frequently forming a mass around the tree, which is dangerous to young trees, as it generally forms in the fall, and the trees are more liable to get winter-killed, as the gum keeps the bark wet, and is equivalent to standing water. About the first of June the worm begins to wind itself up in a cocoon shape, sometimes with one end sticking out of the hole, but most generally just outside of the bark, and about even with the top of the ground, where it remains a few weeks in the pupa state, when it emerges a perfect fly or moth, and soon begins depositing eggs for another crop of worms, from the middle of July to the middle of September, and later. A great many farmers complain of their trees leaking, and the leaves turn yellow prematurely, and tufts of wiry twigs come out on the sides of the larger limbs, and the trees show general symptoms of disease; and seeing one here and there, attribute it to the yellows, and cut them down, believing it to be contagious—which it may be, so far as I know; but I think the most of the yellows we have in this part of the country is the grub. It is frequently the case that a want of cultivation will cause a sickly appearance, which I regret to say is too often the case.

"Farmers, as a general thing, seem to think that if they buy a few trees, and stick them in the ground, with the roots downward, they have accomplished a great feat. That if they live and grow a few inches the first year, and bloom the second year, and continue to bloom year after year, that their trees are doing wonderful, when, in fact, they ought to bloom but very little for several years; that is, they should be so thrifty, and make wood so rapidly, that they would make but few bloom buds, because the most healthy and thrifty growing trees are the least inclined to bloom. It is most likely they will remain there, year after year, a prey to borers and other insets, and at the end of four or five years be but little larger than when first stuck in the ground; whereas, if they had had proper attention in worming and cultivating, they might have produced several good crops of fruit by the time they were five or six years old. But you will say, how are they to produce fruit if they do not bloom? I do not wish to be understood to mean that a tree should not bloom. I mean to convey the idea that a thrifty tree is not so much inclined to bloom as one that is stunted and unhealthy.

"I believe about as good a crop of peaches as I ever saw was on a small orchard that, when in bloom, you could scarcely notice any bloom on the tree at a short distance. But you will say, why don't you stick to your text—'The Destruction of the Peach Borer?'' I don't know of any way more certain and expeditious, after the borer has got into the tree, than what I have said; that is, to hunt him up and stick a knife into him. The main thing is to prevent his getting into the tree; but some will get in and escape notice in spite of us; and the best way that I know of is to go over the orchard, from about the first to the middle of June, and scrape away a portion of the earth, and if any worms or cocoons are discovered, destroy them, being careful to draw the dirt all to one side and not scatter it around; then brush or scrub the tree around the collar to destroy any eggs or young worms that may be there, and brush away the dirt to remove any eggs or worms that may have fallen down and not been killed; because, if they hatch three or four inches from the tree, they never can get back. Then draw the dirt from the opposite side, so as to not put back any that was taken away, to avoid putting back to the tree any eggs or worms that may have been removed and not destroyed. Make a mound six or eight inches high, and make it smooth and tolerably compact around the tree, and your work is done until the middle of September or first of October, when the mound must be taken away, and the tree scrubbed with a stiff brush or stub of an old broom. It is best not to leave the roots bare through the winter, and be careful not to leave a basin around the tree to catch and hold the water. To be successful, it is best to go over the orchard twice a year, from about the first to the middle of June, and again about the middle to the last of September; and, if done at the right time, throwing up a mound, and taking it down, is about all you need to do to eradicate the Peach Borer.

"By procuring a few of the cocoons, and putting them in a glass jar, and slightly covering them with earth, the flies will come out in a short time, and you can examine them at leisure. A great many different things have been recommended to kill the grub in the tree, such as ashes, lime, soapsuds, carbolic acid, hot water, and many other things too numerous to mention; but almost any of these remedies that will dissolve the gum, and let the liquid into the worm, will kill the tree. The best of these remedies that I know of is hot water, and there is not much danger of getting it on too hot. That will kill the worms; but I think the best remedy is that which will prevent them from getting in.

"The mound system is the cheapest and most effectual plan that I know of. It is very important that we should keep our peach trees, as well as other fruit trees, in as healthy condition as possible; and when it can be done so cheap and rapidly, we ought not to neglect it. It is a duty we owe to the rising generation, as well as ourselves; and for a man to plant an orchard, and expect it to flourish or pay him back the price of the trees, without care and attention, is utter folly. What would be thought of the farmer who would plant a field in corn, and let it go to take care of itself, and expect to get a crop? Would we not think he was a fit subject for the lunatic asylum? Much more so would it be with the man who plants an orchard, and expects it to thrive and be remunerative without care. Even the planting of hoed crops in an orchard, and the proper cultivation of them, will have a tendency to keep the borer out of the trees, especially if the ground is stirred immediately around the trees occasionally. Good cultivation is the life of an orchard, especially a peach orchard.

"I have known old trees that were thought to be nearly dead to be resuscitated by ploughing, and not shallow ploughing either (except near the trees), sometimes tearing up roots three fourths to an inch and a half in diameter, to revive and look well. Such is the case with some I have that are sixteen years old, and have had three successive ploughings, with the amount of after cultivation necessary for a crop of corn and potatoes. Other trees in the same orchard were thought to be dead, and were cut out, leaving these some distance apart, but close enough to materially retard the growth of the growing crop. They were cultivated the third time the last season, and made a good, healthy growth, and retained their foliage until late in the fall. But some will say what is the use of taking care of a peach orchard. The fruit is killed by the frost every year. It is true that Jack Frost has blighted our anticipations for the past three or four years, but we have very good reason to believe that it will not always be so; we may reasonably expect a crop, or succession of crops, at no distant date. A great many who have planted large orchards are becoming discouraged, and will neglect their orchards. In fact, I hear of some in our county talking of cutting down their peach orchards, and it is no idle talk with them; they really mean what they say. One man in my neighborhood, who has been discouraged for several years, had neglected his orchard, and last spring thought he would kill his trees; went to work and ploughed his orchard very deep, and planted it in corn. The consequence was, his trees revived, made a good growth, and the foliage looked green and healthy until late in the fall; and he was greatly disappointed in not killing his trees, and raised a pretty good crop of corn in the bargain. Although these trees were considerably infested with the borer, yet the good effects of the ploughing overbalanced the damages done by the enemy. This same orchard was wormed four or five years ago, late in November, and a basin left around the collar of the trees, and many of them were winter killed. Some recommended putting prepared building paper around the trees; let it extend up a few inches, and spread out upon the ground a few inches, to protect them from the borer, which I think is a very good plan, and recommended it many years ago, but have never tried it myself.

"A very good substitute, I would think, for building paper would be heavy manilla paper, such as large heavy sacks are made of, and would be much cheaper. Give it a coat or two of linseed oil, and it will last a long time, and the best fastening would be wire. Get a No. 14 iron wire, wrap it once and a half around, and with a pair of cutting fleeces cut it off without fastening, and the tension of the wire will hold it. This would be better than a string or willow twig, as the growth of the tree would expand the wire without cutting into the bark. A person should use some judgment in regard to the size of the wire; small trees would require small wire; the tension or elasticity of heavy wire would be too great for small trees.

Some recommend painting with coal tar, others spirits of turpentine; but either of them, I think, is dangerous I once lost several fine plum trees by wrapping them with wisps of tow, saturated with spirits of turpentine, to keep down the curculio. I know another man who killed a number of white mulbery trees by painting them with coal tar to prevent the borer from climbing after the fruit. But I think of all the different applications to kill the grub in the trees, that hot soapsuds is the most effectual, and will do for a limited number of trees. Clear, hot water will do just as well, so far as killing the worm is concerued; but there is a fertilizing property about soapsuds that is a great benefit to the tree—the peach tree is a great lover of alkali; and, by the way, it is one of the best fertilizers for almost anything. But lest I should be thought tedious, I will close."

Discussion.—Beatty. It is better to prevent than to cure; the best and cheapest way is to place a small sod around the collar of the tree, and prevent the beetle from depositing its eggs. I have done this, and have never seen any sign of grub on the trees.

Walker. It would be sometimes difficult to get sod convenient. Tobacco stems will always prevent the beetle from depositing its eggs; they have been fairly and squarely tried. Lay them around the tree and take water and pour on them, and you will never find a grub. I speak from experience.

Key. I have seen trees washed with Demoss' compound, and new bark came over them; it invigorates the trees, and promotes their general growth; it kills the motley aphis and borer.

Duncan. Thinks the tobacco stems would be the best. They are cheap, and a good fertilizer.

Prof. Smith. Found that washes would not reach the borer. First take a knife and kill it, then wash with soapsuds and lime water. This done about twice each year will prevent it from making its appearance.

FRUIT PRESERVING AND JELLY MAKING—ESSAY BY MRS. W. J. LEE, BULLITT COUNTY, KENTUCKY.

"In our earliest history of man we find him placed in a garden, surrounded by fruits as his chief article of sustenance. Since fruit has been used for so long a period as food, is so pleasant to the taste, and is so generally liked, we may reasonably presume that the preservation of fruit had also an early origin. Fruit is not only a luxury, but a necessity, since it ripens at a time when our physical wants demand cool, refreshing, and exhilarating food. Its necessity as food, and its high appreciation, not only by epicureans, but by all classes, have led to its preservation beyond the natural season of ripening.

"There are several methods of preserving fruit, the principal of which are as follows: evaporation or drying, preserving with sugar, and by excluding the air, or the canning process. In preserving fruits, the first thing to be considered is an article worthy of preservation. Insipid, poorly-flavored fruit cannot have the properties of good fruit added by any process of preservation; therefore, an inferior article should be rejected.

"Dried fruit has many merits worthy of consideration. If a good article is selected, and the drying properly performed, we obtain a wholesome, delicious, and excellent food, which, for ordinary purposes, stands at the head of preserved fruits. It costs less than other methods of preservation; may be stored away in any quantity; may be kept any length of time, and is easily handled. The main reason that much of our dried fruit is of poor quality is, because indifferent, poorly-flavored fruit is used for that purpose. We would recommend well-ripened, good-flavored fruit. If apples, peaches, or pears, &c., they should be well pared. Apples, pears, &c., should have the cores well removed, and be dried in medium sized pieces. Peaches should be halved, since the natural qualities are thought to be better retained by drying rapidly and in large pieces. Fruit dried in a dry-house is superior to sun-dried fruit. The fruit is fairer in consequence of the rapid drying, and is free from insect depredations.

"The process of preserving fruits in sugar—equal quantities of fruit and sugar—is not used to the extent it was before the canning process became so universal. By this method the preservation of fruits is so diversified that it will always be practicable. For instance, we may take almost any variety of fruit, and we may make a preserve, a jam, a jelly, a marmalade, &c. As a general rule, to make a preserve that is rich, and will keep well, equal quantities of sugar and fruit are used. It is a custom practiced at present, to some extent at least, the object being economy, to make a preserve palatable with a less quantity of sugar, and can it in small cans, which may be opened as needed. This is a very good plan to adopt for ordinary purposes, and for economy, and in the use of sub-acid fruits, but we could not recommend it in preserving very acid fruits, as the syrup will not be so rich, and will be too acid to suit some tastes. Plums, gooseberries, and all very acid fruits, should be preserved with an equal quantity of sugar. To make a good preserve, let us not only recommend a good article of fruit, but a good article of sugar also. Most persons like something to please the eye as well as the taste; therefore, it is desirous that the form of the fruit, or pieces of fruit, should be retained through the process of cooking. To attain this object, it becomes necessary to toughen the fruit, which also may be done in various ways, viz: the fruit may be heated in the syrup, and then spread upon earthen plates or dishes, and be exposed to the sun's rays; or the fruit may be pared and placed in an earthen vessel—a layer of fruit, one of sugar, &c., and remain thus from twelve to thirty-six hours; or small fruits may have a warm syrup poured over them, in which they may stand over-night; after which, the process of cooking may be proceeded with. Jams may be made from almost any fruit. Marmalades may be made from any fruit from which the seed is easily extracted, such as apples, peaches, pears, quinces, &c. Jams and marmalades may be made with three fourths of a pound of sugar to a pound of fruit. Jams should be cooked low, and the sugar should not be added till the fruit has cooked a while, as it is thought the fruit retains, in a greater degree, its natural flavor.

"So far as our experience extends, jelly may be made from almost any fruit; and since we have observed the following directions, we have never had a failure. It matters not how much jelly we wish to make, we make but a quart at a time, which must be done quickly. The fruit, any amount desired, must be boiled in a sufficient quantity of water to thoroughly cook it, after which the juice must be strained from the pulps. Of the juice take one quart, of good white suger take one quart, place both in a porcelain lined kettle (a brass kettle will answer the purpose), and boil rapidly, being careful not to burn it, and skim well. The object in cooking so rapidly is to obtain a fair article. The jelly will be done in about twenty minutes—some kinds, the grape, for instance, will make quicker than almost any other kind. Before taking it from the fire it is necessary to try it, by allowing some to cool on a plate. If it is desired to flavor the jelly, it should be done before removing from the fire. When the first is emptied, a second quart may be taken, and so repeated. We have given explicit directions on jelly making, simply because we more frequently failed than succeeded before we observed the above rules.

"At the present day the canning process is carried on quite extensively, and every housewife knows well the value of having her jars of fruit all ready for use. Here, too, we must begin this process by selecting the best flavored fruit. As the fruit is pared, it should be dropped in cold water to prevent the air from turning it dark. When enough is prepared to fill one or two cans, it should be thoroughly heated, not cooked enough to soften it, and sugar enough added to make it palatable; it is then ready to be removed to the cans. We use the 'Mason Fruit Jar,' with rubber rings, and porcelain lined tops. Our method of filling cans is as follows: we dip a cloth or towel in water, wring it, and wrap the can well, bottom and sides, in the cloth, being careful to have the cloth touch every part of the outer surface; after thus preparing, the can may be filled with boiling fruit, without danger of being broken. We have never broken but one can by putting hot fruit in it, and that was caused by not wrapping it well with the wet cloth. The can should be well filled; no space should be left for air; and the air bubbles should all be broken; after which the tops should be well screwed down; and, after the fruit has cooled, they should be tightened again. The cans should be kept in a cool, dark place. We think it a good plan to pack in boxes of sawdust, which secures a more regular temperature, and protects against the action of the frost. We have tried several times to keep tomatoes in glass cans, and have always failed; with the same preparation in tin cans we have succeeded. Will some of the worthy members of the Kentucky Horticultural Society please give us their experience, and some information on the subject?

"Worthy members of the Kentucky Horticultural Society, in conclusion, permit us to thank you for your patience with us, and allow us to say that we feel ourselves benefited socially, intellectually, and morally by meeting with you. May the ever kind Spirit of the Universe guide you and direct you in paths of wisdom, and make your efforts a grand success. Let us all try to feel that our motto should be 'onward and upward!'"

Goldsmith. The rays of light passing through glass jars produces a chemical change in the fruit, causing it to decay.

A *spectator* asked, is there not a principle inherent in the tomato that leads to its destruction under the influence of light?

Prof. Cook. There is.

E. F. Waide. Thinks the light is the cause, and by guarding against it, we may preserve them indefinitely.

Goldsmith. Thinks it a difficult question. No decay ever takes place without the presence of living germs; they float in the air, and attack all vegetation. Take the apple, and the moment it is mashed, fermentation commences. By heating to a high temperature you can destroy these germs. The new process of drying by heat makes fruit sweet. The tomato is a very delicate fruit, and soon decays. The foundation acid of vinegar is found primarily in the tomato. I think its early decay is inherent.

Prof. Smith. It has been demonstrated that the tomato can be kept in light glass jars by excluding them from the light.

Mrs. Troutman. I have used Mason's jars for five years, and always kept tomatoes excellently; other fruits have done the same. I cook tolerable well, and put in some sugar.

Mrs. Smith. I keep them in glass jars in the cellar; have never had any trouble, as the cellars are dark.

The Production of a Hardier Race of Peaches. Discussion.—Decker. Stated that while we have had four successive failures in the peach crop, nevertheless that some trees had borne peaches every year; they were seedlings, and the fruit was generally poor; but he did not think that inferior quality and hardiness were necessarily combined. We selected our varieties mainly because they were fine, and paid no attention to their hardiness. These years of failures have shown us that we must turn back and try and combine hardiness with size and lusciousness. Now, the question is, is there any reason why the qualities cannot be combined? and if there is none, ought we not to commence the work immediately in the collection of a succession of hardy fine peaches.

Goldsmith. There is no reason why the qualities cannot be combined.

Gaar. I think it is of great importance that we endeavor to secure a more hardy race of peaches by hybridization, or in collecting together the best of the hardy kinds that are scattered around. Hale's Early and Rivers' Seedlings are hardy and the best. I hope the Society will adopt some plan by which we could get at the matter.

The matter was referred to Messrs. S. L. Gaar, Anchorage, Kentucky; J. W. Walker, Anchorage, Kentucky; and J. Decker, Fern creek, Kentucky.

The committee desires all persons who have a hardy peach, of fine quality and size, to notify either of them, giving the growth, time of ripening, size, color, freestone or cling, and has it borne when other varieties immediately around have failed.

List of Fruits for Family Use, by J. W. Walker, Anchorage, Kentucky.—I have been selected to make out a list for a family orchard. I select the following varieties:

SUMMER APPLES.

Early Harvest—Size, medium to large, pale yellow; season first of July.

Benoni—Medium size, striped with red, bears every year heavy crop; tenth of July.

Summer Pearmain—Medium to large, red, good bearer; August.

Golden Sweet—Large size, bears every year; latter part of July.

Sweet Bough—Large, oblong, pale yellow; tenth of July.

Carolina Red June—Medium size, dark red; tenth of July.

AUTUMN APPLES.

Fall Queen or Blackburn—Large, striped with red; September.

Porter—Medium to large, oblong, yellow, good bearer; August and September.

Penn Red Streak—Large, striped red, profuse bearer; September and October.

Rambo—Medium to large, greenish, striped with red; September and October.

Mary Womack—Medium size, very good; September and October.

Fall Pippin—Very large, yellow; September.

WINTER APPLES.

Ben Davis—Large, very handsome, bears young; December to January.

Jenet (*Rawles'*)—Well known variety; keeps well.

Lansinburg—Above medium size, long keeper; from May to June.

Rome Beauty—Large, striped with bright red; November to February.

Smith's Cider—Medium, bright yellow, striped with red; November to March.

Wine Sap—Medium size, deep red, keeps well; December and March.

Moore's Sweet—Medium to large, dark red; December to March.

Lady Finger—Medium to large, deep red; November to January.

Doctor Walker—A seedling of the Jeneting. This apple promises well; bears young and every year; good keeper; not generally known. I have no doubt but what it will rank at the head of the apple list when fully tested. Blooms with the Jeneting.

Transcendant Crab—Largest and handsomest of this class; good for jelly and preserves; August.

Discussion.—This list is not intended to conflict in any way with the general fruit list, but is simply a family list, without regard to its commercial nature.

J. W. Walker. Said the Doctor Walker was a good keeper and fine apple; bore every year; was generally larger than Rawles' Jenet.

Carolina Red June was generally condemned; Maiden's Blush was added to the list; Lady Finger was highly spoken of by all.

Peaches.—Troth's Early, Rodman's Cling, Stump the World, Pope's Yellow Cling, Smock's Late, Early York, Old Mixon Free, Cooper's Mammoth, Heath Cling, Chinese Cling, Vanzant's Superb, Old Mixon Cling, Ward's Late, Heath Free, Red Heath.

Pears.—Lawrence was added to the list.

Plums.—Newman was added to the list.

The balance of the fruit was passed as it stands.

IS IT PROFITABLE TO RAISE MANY VARIETIES?—BY J. S. BEATTY, SIMPSONVILLE, KENTUCKY.

"*Mr. President and Members of the Kentucky Horticultural Society:*

"I believe it is only three years ago that I read an essay at the annual meeting of this Society, on the subject assigned me by your committee for this occasion. You will pardon me if I reproduce some of the thoughts contained in that paper: 'Is it Profitable to Plant Many Varieties?'

"There is not another point connected with fruit-growing so disastrous to the expectations of the commercial orchardists as that of planting many varieties. It does appear hardly possible that, at this day, when so much has been written, so much talk, and so many bitter regrets expressed, to find even one person so unenlightened on the subject of fruits, as to not know that the varieties of apples that succeed best at the North as a winter fruit, do not serve us at the South as a winter luxury, if, indeed, they afford a luxury at all; for many sorts fall and rot while we are luxuriating on something better; therefore, they are a total loss.

"Yet, uncreditable as it may appear, you can hardly find an orchard that does not contain Baldwins, Greenings, Newtown Pippins, Roxberry Russets, and many other sorts of about equal value to those at the South. We wonder why these kinds have a place in so many orchards. The cause is easily explained; they do not slip into all orchards through the same loop-hole.

"Mr. A will tell you he ate the best apple he ever tasted while in the city. It was as handsome as good; therefore, made up his mind to have it in his orchard. It was a Baldwin, grown in Western New York, where it attains that par excellence for which it is so celebrated there.

"Mr. B's grandfather, who lived many years ago in some New England State, had such splendid Greenings. B was a small boy then; can just remember them; he must have Greenings in his collection.

"Mr. C had read, in the American Agriculturist (he reads that paper instead of the Southern Agriculturist), what Henry Ward Beecher had to say about the Northern Spy. He had heard of Beecher; did not know exactly where, when, or how; but he writes well; gives the Spy a big puff; it must be a splendid apple; so he gets it in his orchard; tells his neighbors what a fine apple he had read about in his New York paper; persuades some of them to try it.

"Mr. D, E, F, and G had met with that indomitable tree peddler, with his book of plates and case of preserved fruits. Seeing is believing; so they take some of the wonderful fruits—King of Tompkins, Glorimundi, Beauty of Kent, Alexander, and some other nondescript that is just out, which is the especial pet of the vender. These are a fair sample of the random selection of pears, peaches, plums, cherries, grapes, and all the way down through the small fruits. I present this not overdrawn picture to illustrate how so may worthless varieties of fruits are still being planted. It is surprising that men still go, blindly as it were, still wander in darkness, while there is so much light. Like the master of the vessel that puts to sea without his chart, and disregarding the signal lights warning him of danger, the orchardist who plants, without first consulting the list of fruits recommended by the best horticulturists and horticultural societies of the country, can hope for nothing short of disaster and ruin.

"It is an established fact that there are few varieties adapted to all localities. Fruits that are most popular in the New England States are discarded in the Middle States; those varieties that do best in the North are worthless at the South. In the West, there are varieties adapted to the soils and climate. We have but few kinds that are profitable all over our broad domain; therefore, we may look for disappointments and discouragements if we plant a few trees each, of the almost innumerable kinds that are pronounced number one at the place of their origin. We urge the necessity of planting only those varieties that are known to do well where you intend to plant. In selecting varieties, do not discard a kind that is growing around you that has all the requisites for your purpose. I say, do not discard it because it has no history, or is without a name or has never appeared on the list of some live nurseryman, but plant largely of it. If you go to the catalogues for your selections, do not be influenced by the fine showy plates, or even the fine appearance of the sample fruit, if it is grown in some adjoining State, or even in a distant part of your own State, for there are many things to be considered before you decide what to plant. Some fruits require light, sandy soil; others do best on limestone lands; while other kinds must have heavy clay; some do well on high table-lands, while yet others delight in deep alluvial formations. All these points must be looked to; and, after a thorough and careful survey of the premises, first knowing what your market requires, and having found the thing that will meet your demands, and are satisfied you can grow it successfully, plant largely of it. If you could find a single variety for each of the four seasons that would give a succession, plant only the four kinds;

but four varieties cannot give a succession; therefore, I enjoin it upon the planter to seek for the lowest possible number of varieties that will.

"There are many reasons for not planting many varieties: First, as I stated in the outset, we have but few real good varieties that are adapted to general culture. Second, we have hundreds of worthless sorts; and, if we plant many varieties, we are sure to get a large per cent. of them. Third, it is easier for us to understand the habits and requirements of a few varieties than of a hundred; hence it is less trouble to grow a great many trees of a few varieties, than a few trees of a great many varieties. Fourth, it is much less trouble to gather and store, or prepare for shipping, one hundred barrels of apples of one sort, than it is five barrels each of twenty sorts. Fifth and lastly, large lots of one kind will command better prices and quicker sales, than twenty varieties amounting, in the aggregate, to the same number of barrels.

"There are three classes of fruit-growers. First, the commercial grower; second, the grower for family use only; third, the amateur, who grows fruit for the love of the business. We do not expect to confine the amateur to a few varieties; indeed, we think it commendable in those who have the means and leisure to devote to the testing of all the varieties of fruits. I do not know that I would advise the restriction of family orchards to only enough sorts to give a constant supply of good fruit; but I would advise, even under this, great caution lest something worthless creep in.

"Gentlemen, I feel that I am trespassing upon your time and patience by extending this paper, already beyond what I intended in the outset; but I hope you all will, like myself, see and feel the great importance of the subject. I feel it my duty to leave no stone unturned in endeavoring to save the inexperienced planter from the heavy loss and great disappointments it has been my misfortune to experience. Sixty varieties of apples, with as many of pears and peaches, is the block over which I stumbled into losses and disappointment. I have large grounds filled with those trees just in their prime. I am just on the meridian of life. Fifteen years more, the time it would require to replace these with better kinds, would find me going down the shady slopes of life. Thus a lifetime is spent in bitter disappointment for the want of information on this subject. I am fully aware of the fact that hundreds of fruit-growers are looking to this Society for information upon all the subjects pertaining to our avocation; therefore, we should be very cautious in our deliberations, that we utter not one sentence that is calculated to mislead others; and I hope you will scrutinize this paper closely, and if it contains anything that is not orthodox, I hope it will be suppressed."

Pruning—Discussion.—Pruning in June was recommended by several members. The wounds heal over sooner, and make less water sprouts, and causes the tree to fruit sooner.

Walker. Thinks the wounds made at that time should be shaded, and care taken not to bruise the bark around.

Question. What is the effect of removing the old bark on stunted trees?

Gaar. If you wish to invigorate the tree, it should be done in June, when the sap is thick. It will form a new bark sooner; and, when done in the proper manner, is not injurious to the tree. This is also done to cause trees to bear; it will cause the wood buds to make fruit buds. Another way to bring trees into bearing, is to cut off from one half to two thirds of the year's growth in June.

Lee. My experience is, that all mutilation is done at the expense of the longevity of the tree, and think we ought not to recommend summer pruning. If the flow of sap is retarded in any way, and you cause a formation of fruit buds, you weaken the tree. The tree, in its normal condition, forms wood buds; anything that changes that is injurious. Whenever you see a young tree blossoming freely, you may conclude it is going to die. The best way is to try and promote the healthfulness of the tree, and wait with patience for the fruit. You had better cut a tree down at once than to kill it by piecemeals.

Beatty. Taking off the outside bark will cause trees to bear. I know a neighbor who stripped the bark off a tree that would not bear, and the tree bore very freely afterwards, and is healthy yet. Dr. Hall, of Illinois, always root-pruned, and experienced great benefit. He ploughed very deeply, about two feet, tearing up the roots. He claimed it was of great benefit.

Decker. Thinks it depends entirely on the soil. On Mr. Lee's soil and mine, both strongly impregnated with iron, the natural tendency of the tree is to bear fruit, and we must work to cause growth. On soils rich in humus the tendency is to make growth, and root- and other pruning is a necessity.

Beatty. I would only recommend root pruning on strong rich soil.

Lee. It would be well to know when trees need root pruning. Trees feed at extremities of the roots, and as the roots extend, the food will be obtained at a great distance from the tree. By cutting the roots you cause it to throw out a mass of fibrous roots, and increase its feeding capacity, besides causing it to draw its food nearer the tree; and that is one good thing in root pruning.

Gaar. If the tree makes too much growth, you must root-prune. I would only recommend root pruning for trees under eight years old; after that it would be better to thin out the branches. If you want vigorous growth, prune in February and March. I would not mutilate trees, but just check the growth.

Lee. I would only root-prune while the trees were in a dormant state.

Walker. Every root has tributary branches, and is capable of taking up all the food necessary without cutting, and nature will cause it to find the food wherever it is, near or far.

AMERICAN FORESTRY—BY DR. J. A. WARDER, PRESIDENT AMERICAN FORESTRY ASSOCIATION AND OHIO HORTICULTURAL SOCIETY.

"With our accustomed bushfulness, we cry out that we have the finest country in the world, with the brightest skies and the best climate. We have extensive mountains filled with the richest beds of the most valuable minerals. We have the largest lakes and the longest rivers, the broadest prairies, the most extensive valleys, with the richest and most productive soils. Of course, with all this grandiloquent boasting, some one is ready to add that we have the smartest people; and in this chivalric region, it is also claimed that we have the prettiest women in the world!

"But how about the forests? Yes, we may continue our boasting. We have, indeed, the richest sylvan, and the largest trees of the most valuable species, anywhere to be found in the northern temperate zone. All this is admitted; and it is a matter of patriotic pride, regarding which we may be permitted to boast among ourselves.

"There now, that will do for bravado; but, with regard to the forestry aspect of our country, let us look calmly at the facts, and we shall discover our ignorance, and have less cause for self-gratulation, and find that our people, even those who should be most deeply interested—the occupants of the land—are sadly indifferent to the subject.

"The botanists of our country, as well as many eminent students from Europe, have assured us of the remarkable wealth of our sylva; they have described the species, and have enumerated upon them. But what do we know of systematic forestry? Nothing. Through the industry of Dr. Vasey, the botanist of the Agricultural Department at Washington, the rich products of our arboreal vegetation were finely displayed at the recent Centennial Exhibition. This array of our woods was the largest ever made, and deservedly attracted the attention of all intelligent foreigners.

"Among these sections were shown specimens of more than 400 woody plants, including 37 oaks, 45 of the oak family (*cupuliferæ*), 35 pines, 75 of the pine family (*coniferæ*), 13 walnuts and hickories (*juglans nigora*), 19 of the maple family (*sapindanæ*), 20 of the locust family (*leguimandæ*), and 8 magnolias (*magnoliaceæ*), besides representations of 49 other families.

"In the vast concourse of visitors how many of our own citizens gave to this wonderful collection of our sylvan treasures more than a passing glance, it will be impossible now to tell; but we may venture the assertion, that of the many visitors who attended the great Exhibition, scarcely a hundred Americans gave this most interesting group of specimens a thorough study.

"Yes, we have had, in a state of nature, unaided in the planting or training by the skill of man, but fresh from the hand of the Creator, a grand covering of noble forest trees, in a large extent of our continent. Small remnants of this rich bequest may still be found in limited areas; but the largest portion has been already destroyed. This has been done for the sake of obtaining the timber to be applied in construction, and in the arts among ourselves, or it had been transported to other less highly favored lands; but it is also true that, in vast tracts, the forests have been wastefully destroyed only to make room for cultivated crops, to open up farms; and the portions not so cleared have, in one short century, been so thoroughly culled that they scarcely deserve the name of forests, in any place where they have been accessible to transportation by the rivers and railways.

"Look at the remnants of the noble forests of your own State, which were once worthy objects of the keenest and most skillfully wielded axes of the hardy pioneers, who rescued your fertile soil from the dominion of the Indian and the buffalo. Even where a mistaken policy in the famous Bluegrass Region has induced the farmers to leave choice trees scattered thickly through the pastures, to perform the double office of shading the cattle, and to be preserved for the economic wants of a succeeding generation—see how sadly the old trees are failing, and how many have already failed. This must be well known to you all. We are told, also, that in some parts of your State the scarcity of timber is already beginning to be felt.

"From Mr. Dodge's valuable report on the statistics of forestry in the United States, which was happily illustrated by phonographic charts at the Centennial Exposition, it appears that your State has quite a large proportion of its surface covered with woodland; but, as you may be aware, much of this has been severely culled over, and much is merely a second growth, not always of the most desirable species. Alluding to the authority just referred to, the woodlands of Kentucky are estimated at about forty-nine per cent. of her total area.

"One of your own public officers, whose position on the Geological Survey has given him full opportunities for observation, and whose interest in the subject has directed his attention to forestry, after speaking of the immense waste of lumber, and the large quantities annually consumed, refers to the million and a half of trees required by the railroads of Pennsylvania alone each year, and to 15,550,000,000 cubic feet consumed by the fencing of Kentucky, which is equivalent to more than 186 millions, or thousand feet of fencing, board measure.

"He adds: 'Great as is the drain upon the forests by legitimate causes, it is as nothing compared with the wholesale destruction by the pernicious system of clearing by deadening the trees, so prevalent in the country.'—*John R. Procter, Esq., of the Kentucky Geological Corps.*

"Ten counties in your State are reported by Mr. Dodge as having a minimum of woodland—25 per cent. or less—and with an increasing scarcity, owing to the conditions above named.

"All this, however, may be remedied by the introduction of an enlightened system of forest management and consideration within your borders. There are lands enough in Kentucky that are admirably adapted to this branch of industry, and some of the most valuable and profitable species are especially adapted to your soils. There is much land that should be diverted from the cultivation of arable crops as soon as possible, and devoted to timber plantations. This is as true all over the country as it is here, wherever the ruthless axe has been allowed to have full swing.

"A due proportion of woodland properly distributed is necessary to the highest agricultural results in any country, as has been abundantly proved in Europe, and as is being fully demonstrated even in the broad lands of the great interior basin of rich farming land here in the heart of our own country. What that proportion should be for us, under varying conditions of elevation, soil, and climate, is one of the many important problems to be solved by the future American forestry.

"To an ardent lover of trees, and to an earnest advocate of forest interests, one of the discouraging circumstances of the situation is the lack of interest so generally felt in the subject, even by those who should be the most deeply concerned—the farmers of the land. Hence, too, we need not be surprised at the ignorance which prevails among the people, even as to the names and qualities of the trees growing around them—natives of the soil. Almost any one, to be sure, can tell a pine from an oak, or a cedar from a maple, but how many of your farmers can inform you of the number of species of either that are growing upon his own acres, tell you how to distinguish them, and give you an account of their properties and values? These latter details were familiar enough to the pioneer; but now the axman has vanished before the advance of civilization, and his aptitude, with his knowledge of woodcraft, are as a lost art, and as forgotten lore.

"To bring the matter home, if you will excuse it, let us ask: how many of yourselves—you, the horticulturists of the State—can now catalogue the trees of your own counties, even by their vulgar names, if they may chance to have attracted sufficient attention to be named? Now this is, after all, but a very simple kind of folk-lore, that might well be taught and learned in every district school-house. I would that it were so taught. The training of the faculties of observation that must result, and the comparisons that need to be made, would prove most valuable aid to the pursuit of other branches of study, and, instead of hindering the progress of the student, they would contribute most happily to his advancement in general knowledge. But, alas! this kind of teaching is considered too simple for the village domine—much more so for the learned pedagogue, and the professor of more advanced institutions. Nor, indeed, does it find favor in our much vaunted agricultural colleges, except to a very limited extent in some of the prairie States.

"But it may be asked, is nothing being done for the advancement of forestry in all this land of agricultural societies and agricultural colleges? Indeed, it must be confessed, very little has been effected, especially in those States which have been blessed by Nature with abundant woodland. Massachusetts has granted awards, and now has a liberal premium list, the result of the efforts of a few private citizens, who offer rewards for successful plantations of useful trees. Some of her farmers, near the Atlantic coast, have made successful attempts to clothe their barren lands with trees, and some sowing or planting of pines have been made near her western border, while between them, where much other territory was not yielding a profit in agricultural returns, the neglected fields have, in many places, lapsed into young tree growth that is said to be very promising; but she has done more and better still, in establishing an organic branch of her great educational institution. Harvard College, in connection with her famous botanic garden, has established her Bussy Institute, where trees are planted and studied under the fostering care of Prof. C. S. Sargent, where we shall soon be able to see the finest arboretum of the country. Ohio, some years ago, paid a premium for an essay on the preservation of forests. Kentucky has devoted some attention to the subject in her Geological Report, and Indiana has done the same.

"As in the prairie States, the necessity for planting trees for shade, for shelter from the fierce wind, and for use in various ways, has forced itself upon the attention of the people; so there do we find not only the greatest interest in the subject among the agriculturists, the most urgent in the societies, and also the most extensive plantations of artificial forests. In all cases, these efforts are encouraged by the State Horticultural Societies; and here, too, we find the Agricultural Colleges paying greater attention to this important subject; planting arboretums, cultivating bits of forest, and still better, directing the profits to this study, and familiarizing them with this important class of vegetation.

"Beyond the Mississippi and Missouri, on those broad stretches of open land, tree-planting was soon acknowledged to be a necessity. Wisconsin, Iowa, Minnesota, Nebraska, and Kansas have especially recognized their need, and in right good earnest have they gone to work to supply the lacking forests of that open and almost treeless region. In a broad extent of rich lands in Minnesota, amounting to some twelve millions acres, the timber does not exceed one acre to the quarter section of prairie.

"Our western friends have established their Arbor Day, which is dedicated to tree-planting. In some States small premiums are offered to encourage the most industrious and successful; and it is surprising how many trees and cuttings have been put into the ground in a single day. The returns show that millions of trees have been planted annually.

"Mr. L. B. Hodges, Secretary of the Minnesota Forestry Association, which has this matter in charge, reports that when he was, some time ago, engaged as Forestry Commissioner on the St. Paul and Pacific Railroad, he had men who could plant 2,000 cuttings, or 1,000 seedling trees in a day, and who, on extra occasions, would double that number. Under the stimulus of the premiums offered in 1875, however, some mere boys planted between ten and eleven thousand cuttings. He further says that there are men in that State who can plant ten thousand cuttings in a day.—*Official Report.*

"On the first Tuesday of May, 1876, the Centennial Arbor Day of Minnesota, not less than one and a half million (1,500,000) trees and cuttings were planted, and during the season from eight to ten millions were set out.

"As an evidence of the rapid and successful growth of trees in the prairie regions, allow me to quote further from the same report, the statement that many hundred thousand trees now standing in Minnesota will yield from half a cord to one cord and a half each, all of which have been grown from cuttings or seedlings planted within from ten to twenty years.

"We, of the timber regions, cannot realize the importance of tree-planting on the plains, till we consider that these vast regions are almost absolutely treeless, having at best a mere fringe along the streams.

"The State Horticultural Society of Iowa offered liberal premiums, to the amount of $345, for plantations of the greatest number of species of conifers, ash-trees, nut-bearing trees and oaks, wild cherry, elm, birch and box-elder, cottonwood, basswood, willow, maples, and soft wood, and the honey locust trees.

"Our Hawkeye friends advise close planting, preferring four by four feet, and in their regulations, attached to the premium list, they require that, whether set in solid blocks, or in shelter belts, there must be at least 2,000 living trees to the acre, when offered for the award, and these must be counted in the autumn, between the 15th of September and the 10th of October.

"They report, however, as an encouraging experiment, the result of planting done in 1872, on some ten acres, by T. J. Randall, Dallas county. He set soft maple, white ash, and red elm, eight by eight feet apart. In the spring of 1877 they were from twelve to fifteen feet high. When two years old he planted ash and black walnut between them, so that all stood four feet apart. These last-planted trees shot up more rapidly in consequence of the shade from the earlier planting. He also found that one-year old ash seedlings, though quite small, grew better, and in three years outstripped older plants two and three feet high, set at the same time. He recommended setting walnuts in the autumn, always among other trees that have two years the start. He is satisfied that his plantations have richly repaid all the labor bestowed, and feels justified in extending the work.

"Lawrence Fulton, of Cedar county, who took the premium for ash plantation in 1876, reports a hardy variety of catalpa that has withstood the severe winters of Iowa as far north as latitude 42.

"Some of the members reported plowing out the seedlings from the nursery rows, and then planting them in again, where they are to grow permanently. This plan, which was long ago practiced in planting cottonwood seedlings in Kansas, though a slovenly method, very much diminished the labor and expense. The requirements are to prepare the soil well; to mark out deeply with the plow; to distribute the plants, setting them against the landside of the furrow, and covering with the plow. If it be desired to make them look well, they may be straightened up when tramping the soil above the roots; but this is not absolutely necessary with the cottonwood, which may be fixed by using a common roller; if prostrate, a new shoot springs from near the crown or collar of the root, and takes the place of the original stem.

"The Iowa Society has rendered a signal service to the people of the State by preparing, from year to year, an essay, for gratuitous distribution, in which are given concise directions for procuring, storing, planting, and cultivating tree-seeds, and trees for shelter belts, and artificial forests in Iowa.

"One large farmer, Judge C. E. Whiting, of Manona county, has forty acres in belts and groves; the oldest are eighteen years planted. These furnish all the fuel required on the farm and timber for various purposes, besides fencing. He is emphatic in the declaration that the remaining land will, year by year, produce larger and more certain results, with any crops adapted to the latitude, than the whole quarter section would do without the belts.

"The early efforts of the Wisconsin Society must not be overlooked, since the planters of the Northwest have derived great benefit from the pamphlet they issued many years ago upon tree-planting, the joint production of Messrs. Lapham and Knapp.

"Nor should the progress made by young Nebraska and Kansas be ignored, in both which States many millions of trees have been set out to give shelter to the prairies. Let us trust they will be encouraged to keep on with the good work, for, owing to the vast extent of their territory, there is room for many millions more, and these will be required to produce the desired shelter; to furnish the needed supplies of fuel and timber; and to give the appearance of a wooded country to those interminable plains.

"The great railroad lines of the West have done a good work in tree-planting, which is none the less praiseworthy, because it was done in their own interest, for it was also and equally in the interest of the people. By their experiments, extended far out into the great plains, it has been demonstrated that trees can and will grow there—a fact of great importance, when set in opposition to the oft repeated assertion that these plains were grassy and treeless, because the soil and climate were unfitted for tree-growth.

"Clothing the prairies with grass being no longer a doubtful problem, the greatest obstacle to the settlement and improvement of the country has been happily removed.

"The various efforts that have been made by these great corporations, by State societies, and by numerous individuals, all through the prairie regions, have given us much valuable experience in this new department of agriculture. We have learned how easy a thing it is to make trees grow from seed by cuttings, and the farmers have realized how great the benefit conferred by shelter belts and groves in the protection of themselves, their fields, and their live stock—especially when the piercing winds sweep over the prairies.

"It is true that, as yet, but a few varieties have been tested in these new plantations, and they have mostly been selected from the native growth of the country, chiefly the cottonwood, elm, and water maple, to which were added the Lombardy poplar, and the white willow of Europe. These hardy limbs have been well chosen as the pioneers of our western plantings, on account of their happy adaptation to the circumstances, because of the facility with which they may be propagated, and on account of their rapid growth. After these have been once established, other more valuable kinds can be introduced, which would most certainly have failed had they been planted without some such protection.

"Few kinds have been extensively planted, but many others are under trial to a limited extent. They have yet to be tested; and, no doubt, many will succumb to the conditions to which they will be exposed, so different in soil, elevation, and exposure to those of their native homes. As to the ultimate results, no one can now venture to predict what may be their fate, failure or success. But they must be tried, and in various parts of the country; for, while nature has indicated the range of plants by their original habitats, we have found that the possible range is often much more extended than the natural. And so it is with soils; since we have found that many plants, even, adapt themselves to situations vastly different from those in which they naturally occur.

"All these experiments involve the expenditure of labor, of money, and, what is of more consequence, of time. Great patience will be required, and untiring perseverance will be needed.

"One of the most important considerations for you, is that which is to settle the question, where shall we plant?

"In this State, certainly, you should plant the waste lands, of which, in every county, there are enough to be found; and reserve for forage and food plants only those portions which are fertile and arable.

"The regions about the sources of all the rivers, especially where the surface is broken, should be consecrated to forests in their largest extent. This will secure their continuous flow as living streams, instead of the condition in which we so often find them, in dry channels. Where the surface is elevated and much broken, there is another object of great importance affected by the woodland. The rains falling upon a forest are, for a while, in a great degree, retained upon the surface. Much of it is permanently retained, sinking into the soil and among the rocks, whence a portion of it again issues in perennial springs, while a part only will escape in clear and limpid rills, showing that there had been no abrasion of the soil; whereas, had this hilly country been cleared and in cultivation, the showers falling upon them must flow off with great rapidity, carrying away considerable portions of the soil, and eventually causing great ruts and gullies in the subsoil, so as to leave the surface unfit for cultivation, and a frightful waste. The larger streams are at the same time filled with the debris carried down by the torrents, navigation is impeded, the floods are exaggerated, and the stage of low water is protracted. For the same reasons, the hill-sides along our rivers, especially where they are declivitous, should be preserved in woodland; or, if bare, they should be replanted as soon as possible. Rocky ledges and ridges unfit for cultivation should be occupied by forests.

"Planting the trees is but the beginning of a forest; there are many other things to be considered. Even the planting and sowing require knowledge and judgment to select the best methods of procedure, and the varieties best adapted to the lands that are to be afforested.

"Then comes the question of grouping and commingling the different species, which will require a knowledge as to which may be congenial or otherwise. Some kinds are gregarious, and will be found to thrive best in solid masses of a single species, while others, more social, get along very well in an assorted group. Some grow faster than others, and would soon crowd and smother them, while some trees are absolutely obnoxious to other kinds, which prevents success in mixed plantations containing them. Some trees rise to greater height than others. Such should not be mixed.

"The cultivation of the young trees is a matter of the greatest importance. On arable lands, such as are largely planted by our Western friends, this is a very simple matter. It is like the treatment of the familiar corn crop. This is continued for one, two, or three years, according to the more or less thrifty growth of the species planted. In very broken and stony lands, and on steep declivities, the use of the plough is often out of the question, and the chief culture must be done with the hoe and other implements by which the weeds may be subdued. This, however, need only be practiced while the trees are small, for so soon as they shade the ground, they will maintain their supremacy over all vegetable intruders; and of course the sensible forester will exclude all animals from grazing within the forest inclosure.

"Then comes the trimming—a process that, under certain circumstances, is necessary, though it should be avoided as much as possible, and may be prevented in many cases by a proper management, and by observing nature's methods as carried on in the forests primeval. Which planting is most important in reference to this result? Nature plants thickly, and the young trees do their own trimming, by shooting upward to the light, and their side branches are soon smothered for want of air; still, in the young plantations, it is well to remove all aspiring branches that might interfere with the strength of the main shoot or leader. Some species will require much more care in this respect than others, and these should never be planted widely. A case in point has already been cited from the experience of a planter in Iowa, who advises to set the walnut in alternate rows among elms and maples that have had a couple of years the start.

"Thinning the young forest is another process where we shall have much to learn. A great deal of this will be effected by natural causes, such as are so useful in the trimming; the weaker and more slender must yield to those more robust; but human agency may often be brought to bear with the most beneficial results.

"Thus you see there is work enough to do in building up a forest; but it is pleasant work, and you may have the great satisfaction of reflecting that you are building not only a monument to your own wise forethought and industry, but that it is also a monument that will inure to the benefit of those who may succeed you—a monument that is living, growing, and increasing in value, rather than one which, in a few short years, may become a crumbling ruin, soon, perhaps, to fall a dishonored shaft. Even in a cemetery, what fitter memento of the useful citizen than a noble oak planted in the middle of his allotment, by his own hand, during life? This has been done at the famous cemetery at Cincinnati, Ohio.

"Upon this occasion, lest your patience be wearied, the indications only of what you will have to do have been pointed out. The details and their various application, as you may readily imagine, will require study and labor. These details it will be necessary for us to learn; and who shall be our teacher? We must try this, try that method, and keep on trying, until eventually we shall learn what is best for us, and then we shall have teachers enough.

"We must continue these various experiments, and with every useful species. Then we must faithfully and fully report the results, and publish them to the world. We must learn all we can from the great book of nature, both as to normal and abnormal growth of trees. We must make ourselves familiar with our own trees. We must observe, also, the behavior of those species that have been introduced from other countries, and from distant parts of our own land. We must watch and compare the effects of different modes of treatment. Is there not here work enough? Yes, truly! and work that will require long years before we shall be able to realize that great desideratum—the best methods for us.

"But, it may be asked, can we not do better than to expend our efforts exclusively in such laborious endeavors to solve these riddles? While we continue thus to pursue the experiments necessary to answer questions growing out of our peculiar conditions, were it not well, also, to attempt to gather the results of European experiments?

"In those countries, the same circumstances, the same ignorance that we now deplore, once existed. They were met, and the difficulties were overcome. The best talents, and the most acute minds of those lands, were directed to the solution of just such problems as those which now rise to obstruct our progress.

"Efforts for the removal of the difficulties have been applied continuously for centuries, and now behold the happy results in the most beautiful and the most valuable forests.

"The literature of forestry has grown to be an extensive library. Principles as well as practice have been settled for them—the former we may safely adapt as axioms; the latter we may be able to weigh, to estimate, and adapt to our varying conditions.

"What we now most seriously need is a judicious report upon the present status of European forestry, as seen by an intelligent and suitably qualified American.

"Such a report, rendered by an industrious, practical observer, would be an invaluable gift from the General Government to the great American nation. Can such a report be had?"

SALE OF FRUITS—ESSAY BY H. S. DUNCAN, OF LOUISVILLE, KENTUCKY.

"*Mr. President and Members of the Kentucky Horticultural Society:*

"Having been appointed to write an essay on the 'Handling and Marketing of Fruits, and Best Method of Disposing of Surplus Stock,' I take great pleasure in giving you my views on the subject, and will try and be as brief as possible.

"At our last annual meeting I read an article on the distribution of surplus fruits, and obtained the views of others on the subject, which I hope proved of mutual advantage to all interested.

"The advantages to be derived from the Horticultural Society is the practical experience and research of some of the best horticulturists in the State, consisting of their experience in the cultivation of fruits; which are the most profitable for market; best for family use; the kinds best adapted to the soil and climate of Kentucky and the neighboring States; the best mode of gathering and packing for market; disposing of same to the best advantage of both grower and consumer.

"Much of the above information is contained in the records of this Society, extending back for over forty years, and should be in the hands of every farmer and fruit-grower in the State.

"I would recommend that the attention of our Governor and Legislature be called to the fact that this information, of such vital importance to the people, can be had free, and should be published by the State, and a free distribution made to the people in all parts of the State. There is more money paid out annually for worthless trees and plants, and varieties not adapted to our climate, than would pay for the publication and distribution of this information. Not only is the money lost that is paid out for the trees and plants, but the time and labor spent in the cultivation of the same for five or ten years, where if the farmer had a standard book to refer to in making his selections, there would be more trees, of good substantial varieties, that have beeen tried and proven a success.

"In selecting fruits, the grower should select the very best, for two reasons. First, it costs no more to raise fine fruit trees than it does to raise an inferior article; and second, fine fruit will always command a good price, while common fruit cannot be disposed of at all, and only tends to cut down the price of the good.

"In packing fruit, the grower should never put up fruit that he would not be willing to have his name go on; and the party putting up fruit fraudulently should be held responsible for damages to the purchaser, and should be subject to prosecution for obtaining money under false pretenses. I have had enough experience in handling fruit to satisfy me of this. I will here give an instance. I purchased for a customer last summer twenty barrels of apples, looking into both ends of the barrels, which were to my entire satisfaction. One of the choice barrels I let a customer here have, who, on opening it, when he got about one fourth of the way down in it, he found the middle of it filled with trash, hardly fit for the still-house. I then opened the balance of them, and found them in the same condition. Consequently I had to repack them, getting nine barrels of good apples out of the twenty. There is too much of this false packing for the sake of a little gain, without looking to the loss of reputation and trade; for, when a man is deceived once, he will not buy of the same party again. But when a man puts his fruit up honestly, and always puts his name on it, it will get to be known, and will always command the highest price; for instance, I have been selling L. A. Downer's fruit since (if I remember right) 1866, and have never had any complaint made of a single box, and the dealers here have got to know his brand so well, that when I receive a lot of fruit, his boxes are always picked out first, and the past season generally sold before arrival, and always for the best price of any in the market.

"Now, the result of our labors has developed this much, that there should be an organization of fruit-growers and commission merchants, for the purpose of disposing of the surplus fruits daily. The plan of action being an office, and clerk or superintendent, all commission merchants and fruit-growers belonging to the Society would be required to place on the books for sale, before 3 P. M. daily, all the fruit they may have for sale up to say 5 o'clock next morning. At 3 o'clock the clerk would make out a list, and telegraph to agents in the prominent cities, North or South, as the case may be, who will put the fruit on the market at all points by 3:30 P. M. The agent in each city would take the orders for fruit wanted, and at 8 P. M. sales to be closed and orders sent in. If the fruit is not all sold on orders, the surplus to be shipped, if desired, to the best market, and by this plan the fruits would be distributed to the points where most needed. The same may be done with early vegetables. By this method we would avoid the gluts frequently experienced in the larger cities."

Grapes.—Mr. Duncan. I always recommended the *Concord.* It is the best for the poor man, the rich man, and the lazy man. Treat it as you will, you always get repaid for your labor.

Mr. Lee. How does it do with the members after bearing two crops? It always rots with me.

Mr. Decker. It is advised to plant it ten feet apart; and, after bearing two crops, cut the old vines out. In the meantime, have a branch layered between to take the place of the one removed. It is asserted, that, by the constant renewal on this system, you can always have good grapes, as they only rot on the old vines.

Prof. Smith. The *Concord* has done finely with me for six years; always have good bunches, and have found it very profitable. I have about twelve varieties, and it and the *Ives* are the best I have.

Mr. Walker. I have the *Concord* ten years old, and it is always good. I never prune close.

Mr. Beatty. Asked if any of the members had examined for the *phyloxera.* It is supposed to be the cause of the rot.

Mr. Duncan. Thinks too much pruning the main cause.

Mr. Key. Mr. Kennedy showed some insects in the joints of some canes; we were unable to determine what they were. Mr. Kennedy said many of his grapes were affected with this insect.

Mr. Walker. I have a vine in bluegrass sod that always bears good grapes. It has never been cultivated.

Mr. W. S. Helm. You can't improve on nature. I spent about $2,000 trying it, and failed. I employed a German to take care of a splendid vineyard. He cut and cut, and ruined my vines, and I gave up grapes. I knew a place where they were never cultivated, and always had plenty of grapes.

Prof. Smith. Spoke of Col. Hancock's vineyard, which was planted eight feet apart each way, and posts set and wires stretched across the top of the posts each way, the vines trained along these wires. In cultivation, the horse passed underneath, and cultivated either way. He produced about 1,200 gallons of wine per acre. I have only about one fourth of an acre. We have only failed once in seven years to have heavy crops. That year they were killed by frost. I train on a trellis; and regard *Concord* as the best for family use, and *Ives* for wine.

"ANCHORAGE, KY., April 23, 1878.

"*President Key:*

"In the published discussion by the members of the Horticultural Society on 'root pruning,' my views were not expressed as I intended to convey them. I am entirely opposed to root pruning, unless the tree is to be removed; and then it is necessary to root prune in order to insure its growth after being transplanted. Trees seven to eight years old, having been previously root pruned, can be easily removed in this way, if they are pears. My remedy, when the tree is very vigorous and fails to bear fruit, is to thin the branches of the tree in June, which will produce fruitfulness. I am opposed to root pruning from the fact that all the roots of a tree are essential to perpetuate its vigorous growth and productiveness. Yours,

"S. L GAAR."

LAWN AND ORNAMENTAL TREE-PLANTING—ESSAY BY S. L. GAAR, ANCHORAGE, KENTUCKY.

"*Mr. President and Members of the Kentucky Horticultural Society:*

"I have been assigned by the members of the Kentucky Horticultural Society to the important duty of giving my views in regard to lawn and ornamental tree-planting. While we have treaties in abundance on the various departments of the arts and sciences, we hardly ever have the pleasure of reading an essay on the elegant art of landscape gardening. It is from the fact that the interest has not been manifested in America in beautifying our homes, which has left us ignorant, in a great measure, of making homes desirable and attractive. There are thousands of our farmers, mechanics, and merchants who would ornament their grounds and embellish their places, if they knew the *modus operandi.*

"I propose, on this occasion, to present some leading principles that will enable the inexperienced to acquire sufficient knowledge to adorn and beautify their homes in a delightful and satisfactory manner. In the first place, make a plot of your grounds; lay off your road and walks in curves; the approach road that leaves the public highway must not be in front of the house. If the ground is suitable, the entrance should be so that you can have the same view to the end as to the front of the building, and as you advance, you gradually come in front of the house. Here you may form a circle, or, if the intended lawn is large enough, you may continue the road beyond the house before making a circle to return; at the same time continue the road that forms part of the circle to near the outlines of the lawn, coming in the approach road near the entrance. Having the ground now ready for planting deciduous and ornamental trees, shrubs, vines, &c., you are ready to begin work.

"The first consideration is to take a stand-point at the residence, and view the premises of the lawn in every direction, in order to ascertain the sightly and unsightly objects. No obstructions should be placed in the way of a desirable view; but sufficient space left between the trees to insure the view of a sightly object. The unsightly objects must be hid by clumps of trees. There must be two side views at least from the public highway, which give the house a majestic appearance. Much attention should be given to sightly objects in the distance, which often add novelty and grandeur to the view. In planting out trees in a lawn, the laws of nature must be consulted and conform near to it, as the art of landscape gardening will aid in carrying out the design intended. Any person who will reflect for a moment, can see at once the great diversity of surface, change of views, aspects, &c., in different country residences, so that it is impossible to fix any exact rules for arranging plans to suit all localities.

"It is owing altogether to the surrounding circumstances; what would be adapted to a level or smooth surface, would not be suitable for hilly or rolling grounds. Trees should be planted out in regular groups along the roads and walks, and on the boundary line of the lawn. The largest number of trees to form a group should be planted in the angles of the different curves; and also in the rear of the residence it may require clumps of trees to hide unsightly objects, and make the back-yard cheerful.

"Here is what Mr. Downing says: 'By the judicious employment of trees in the embellishment of a country residence, we may effect the greatest alterations and improvements within the scope of landscape gardening. Buildings which are tamely inspired, or even mean in appearance, may be made interesting, and often picturesque, by a proper disposition of trees. Edifices, or parts of them, that are unsightly, or which it is desirable, partly or wholly, to conceal, can readily be hidden or improved by woods and walks and roads, which otherwise would be but a simple way of approach from one point to another. An elegant arrangement of trees on the margins or adjacent to them, make the most interesting and pleasing portion of the residence.'

"In order to beautify and embellish homes more perfectly, there should be statues and vases placed in front of the residence, also flower beds for roses, bedding out plants, &c., and more remote from the house have beds of all the leading varieties of shrubs, all of which will add beauty and grandeur to the surroundings.

"Let me impress upon the minds of every individual, who has a small or large place, the importance of adorning and beautifying their homes. It makes a place of pleasure for the family circle, and attractive to the neighbors. It really becomes to be SWEET HOME."

Discussion.—Mr. Duncan. Recommended roses and bedding plants as adding much to the beauty, and should not be neglected.

* BLUEGRASS BEEKEEPERS' ASSOCIATION—THE ANNUAL MEETING IN LEXINGTON.

The Annual Convention of the Bluegrass Beekeepers' Association took place in Lexington, Tuesday, October 1, 1878.

The meeting was called to order by Vice President H. C. Hersperger, of Jessamine, after which the following gentlemen signed the constitution, and were duly enrolled: J. F. Musselman, of Scott county; J. L. Williams, of Clark county; J. W. Egbert, of Mercer county; A. C. Cunningham, of Mercer county; John F. Bean, of Montgomery county; E. C. Bryan, of Fayette county; J. W. Rose, of Fayette county; P. W. Prowell, of Scott county; R. M. Gano, Dallas, Texas; W. B. Herring, of Scott county.

Moved and carried, that article 10 of the constitution read "States," instead of "counties."

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* From Farmers' Home Journal, Louisville.

Moved and carried, that article 1 read "Central Kentucky Beekeepers' Association," instead of "Bluegrass Beekeepers' Association."

The following officers were elected to serve the ensuing year:

President—H. C. Hersperger, Jessamine county.

Secretary—W. Williamson, Lexington.

Treasurer—J. M. Holman, Fayette county.

Vice Presidents—J. W. Rose, Fayette; John W. Bean, Montgomery; W. B. Herring, Scott; J. W. Egbert, Mercer; Thomas A. Hutchcraft, Bourbon; Thomas S. Williams, Woodford; Dr. Jasper, Jessamine.

The Secretary offered the following resolutions, which were adopted:

Resolved, That a committee of three be appointed to confer with the President and Directors of the Agricultural and Mechanical Association of Fayette county, as to their willingness to encourage apiarists, and the advancement of bee culture, by offering such premiums at their annual fairs as they may think proper; be it further

Resolved, That each Vice President of this Association act as special committee to confer with the President and Directors of the Agricultural or Fair Associations in the counties they represent, with the same object in view as the general committee of Fayette county, and each and all report to this Association on the first Tuesday in May next.

The President appointed the following committee for Fayette county: W. Williamson, Thos. T. Hayes, J. M. Holman.

Moved and carried, that this Association offer, as a special premium to apiculturists, a silver medal, the article or object to be decided upon by the committee and President and Directors of the Agricultural and Mechanical Association: *Provided, however*, That the report of the committee is satisfactory, and indorsed by a majority present at the next meeting of this Association on the first Tuesday in May, 1879.

The President then read the following questions for general discussion:

"Will it pay to raise bee pasture for bees alone?"

J. F. Bean said it certainly would, if it would pay to raise crops at all; he recommended buckwheat, which he had sown extensively, and although the crop has many times been a complete failure, he felt he had been amply repaid in the benefit it had been to his bees alone.

The President and other gentlemen all agreed with Mr. Bean.

General Gano said that all crops for bees would pay, as all the bees gathered was clear profit, and he believes there is nothing more profitable than bees. In Texas a gentleman he knew invested $165, and made that season, over and above the investment, $491 clear profit—300 per cent.

The President said he favored every plant that produced honey, and nearly every plant would; but white clover is the *best* crop from which honey can be produced. He commenced keeping bees only five years ago, and he believed they had been the means of making him a better farmer every year he has kept them, and induced him to cultivate a taste for all that is beautiful in nature that he might never have acquired.

J. F. Bean said the bee willow was one of the best honey-producing trees that grows. It blooms in February, and the bees gather both honey and pollen from it, and every beekeeper ought to plant them, not only for their honey-producing qualities, but they are a beautiful shade and ornamental tree as well.

Question.—How can we prevent bees raising brood in the top story?

J. F. Bean said that young swarms should be kept in the lower story until firmly established.

The Secretary said, in the case of old colonies, often the brood chamber became so literally full of honey and brood that the queen had nowhere to lay her eggs, and would naturally go to the top story, either in boxes or frames, to perform her maternal duty; when, if the frames were emptied of all the honey in them by the honey extractor, it would give ample room for the queen, and insure an active and industrious colony; when otherwise, the whole harmony of the colony is in danger. The free use of the extractor is the best preventive for bees raising brood in the top story.

J. W. Rose agreed that the plan spoken of by the Secretary was the only successful one known.

Question.—When is the best time to Italianize an apiary, and how to introduce queens?

John R. Williamson said, in the working season. The most successful plan he has ever tried was to cage the young queen, put it in the hive, leave the old queen in the hive also, and, in three or four days take the old queen out, smoke the colony well, and let the young queen loose. By this plan there is no time lost, for the young queen commences as the old one drops off.

Question.—Are there any moth-proof hives; if so, which is the best?

J. R. Williamson said the only moth-proof hives known are strong colonies, and no others are worth keeping. If you have weak colonies, put two weak ones together, and make one strong one; otherwise, they are worthless.

J. W. Egbert said he thought a moth-proof hive would be a bee-proof hive. As, to keep moths out, you would have to keep the bees out too, and the only sure remedy is strong colonies, and the bees will protect themselves. These statements were generally agreed to.

Elder Gano said he claimed his Vanhorn hive to be a moth-proof hive.

Question. What is the best remedy for bee stings?

The Secretary said a bruised fresh tomato leaf, quickly applied, was an infallible preventive from swelling and pain from bee stings. When that could not be readily obtained, squeeze out all the poison possible after removing the sting, and apply ammonia, which is a sure remedy, if promptly applied before the swelling has commenced.

Question. What is required from a bee-keeper to make bee-keeping successful and profitable?

The Secretary said it could be answered in a few words. Like all well known successful business principles, it requires study, application, perseverance, energy, and labor; without this, nothing can succeed.

General Gano said all business succeeded or failed according to the amount of true business capacity applied or wanting, and the bee business is no exception, only so far that the profits are larger than any other agricultural or commercial business known.

Question. What are the advantages of comb foundation?

The Secretary said straight combs were insured by its use; more than half the labor for the bees is saved, and all worker comb. There are other advantages; but any one of these would insure the indorsement of the most progressive bee-keepers in the country.

The President said to use it in small strips, as starters in boxes, it is invaluable. It was generally agreed that comb foundation is a valuable and successful invention.

Lexington was selected as the next place of meeting.

*SKETCHES ON BEE-CULTURE.

When we consider the past and present of all things in this beautiful world of ours, we become bewildered at the grandeur and wisdom of its contrivance, and must confess that "all things are possible with God;"

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*I am indebted for this article on Bee-culture to Mr. W. Williamson, Secretary of the "Bluegrass Bee-keepers' Association," of Lexington, Kentucky. Mr. W. is a highly intelligent gentleman, well posted about bees, and one of the best practical bee-keepers in Kentucky.

and science, the great teacher, may be but the means employed by an Omnipotent Being to bring to human knowledge that which "He hath foreordained."

Bee-culture, as brought forth and developed by science and the patient toil and observations of practical men, has proven such a source of unspeakable pleasure, profit, and amazement that even to-day, with all our knowledge of bees, we cannot realize half the mission of these humble little workers.

Apiculture is one of the oldest industries known to man. Bees and honey have been spoken of from time immemorial. Even the Bible tells us of bees that they gather honey, and labor for man's use; and we find that, as far back as 361 years before Christ, Democritus, one of the Greek philosophers, the first apiarist known to history, whose works have been handed down to us, tells of this wonderful insect. Alexander De Montfort wrote the first two modern practical essays on bees about the middle of the 17th century, entitled "The Portrait of the Honey-fly, its Virtues, Forms, etc." He mentions, among the ancient writers on bees, Aristotle, Columella, Varro, and others more or less known among the classical authors of Greece and Rome. Very little was known of modern bee-culture until the 18th century, when a number of practical bee fanciers became engrossed with the interesting subject. Among these, the renowned Huber, although nearly blind (with the aid of his assistant), saw more into the habits of the bee than all other apiarists of the period when he wrote. Prominent among the apiarists of the present age (who have written standard works) are: Dzierzon, Lenckart, Von Siebold, Sir John Lubbock, Langstroth, Wagner, Quinby, Adam Grimm, Harbison, Heatherington, Prof. Cook, King, and many others, to all of whom we are largely indebted for the present state of bee-culture.

Bee-hives.—Although there are a thousand or more bee-hives, whose merits are advocated by different parties, many of them more or less interested, all apiarists now agree that the best hives must have movable frames. For the idea of this frame we are indebted to the Rev. L. L. Langstroth, who invented the Langstroth bee-hive more than 25 years ago. Since which time, the Langstroth hives have grown so much in favor for usefulness, simplicity, and every natural requirement of the bee, that to-day they are indorsed and used by nine tenths of all the bee-keepers in the United States, and still growing in popularity. Surely no higher commendation than this can be given, and no stronger evidence of their great *superiority is* necessary.

Italian Bees.—Previous to 1859 little or nothing was known in this country of this beautlful race of bees, when Messrs. Wagner & Colvin made the first importation from the apiary of the celebrated Dzierzon, of Germany. In the following year, 1860, S. P. Parsons brought the first colony direct from Italy, and since that time regular importations have been made by prominent and progressive apiarists all over this country, until the stock has become so well diffused, that soon the Native or Black Bees will be driven from the most profitable apiaries. I will mention a few points of excellence of the Italian over the Black Bees; they are larger and stronger; can fly a longer distance for forage; their probosces are longer, which enables them to extract honey from flowers where the Blacks cannot penetrate; they breed earlier in the spring; swarm earlier, and in greater numbers; are more gentle and amiable, and will protect their brood and stores better from moths and other intruders. While these statements are supported by thousands of apiarists all over the land, I will only quote the testimony of W. B. Rush, of Carrollton, Louisiana, after seven years of patient study on the subject. He says:

"The superiority of the Italians is so visible that it does seem it would long have been settled. I have had them side by side for seven years—pure Italians, pure Blacks, and Hybrids; there are three points in which to compare them. First, the Italian hives contain double the number of bees, and often *three times* as many; they travel farther for forage, and are never troubled by moth; last, but not least, in a poor season they will average ten pounds to one for the Black's surplus honey. Now, I don't need compare them in any other points, yet the Italians have claims of being superior in other respects."

The Mel Extractor was invented about ten years ago by Herr Von Heuschka in Germany. The discovery was, like others, accidental. He noticed that a piece of comb attached to a string in the hands of his boy, being twirled, was emptied of its honey. The idea was followed, and the extractor was invented. Of course his machine has been greatly improved; yet the principle which he brought to light is the same as that of our latest improved extractors of to-day. The benefits derived from the use of the extractor are numerous and invaluable, foremost among which is the labor it saves the bees in making comb. Since it has been estimated by experiments that the bees make from fifteen to twenty pounds of honey in the same time it takes to make one pound of comb; or, in other words, the bees consume from fifteen to twenty pounds of honey in making one pound of comb. I will also state that, often in the honey season, the brood-chamber becomes literally jammed with brood and honey, and the queen has nowhere to lay her eggs; then, if the extractor is brought to their relief, the bees will not hang idly around the queen; she will have plenty of room to lay her eggs; the colonies will grow stronger in numbers, and the swarms not only make more honey, but become moth-proof and safer from attacks of robbers or disease. Honey extracted from the combs, just after being stored, being the very essence of wild flowers, is a delicious luxury, either as food or medicine.

Comb Foundation.—The benefits derived from this invention are incalculable. The "comb foundation" is made from beeswax rolled out into sheets about three sixteenths of an inch thick, then passed through a double set of rollers, in order to cast or indent the exact number of cells to the square inch as are in the natural comb. It is then ready to be attached to the honey or brood frames. The bees draw these cells out to the full size required in from one to five days; fill them with honey, or the queen deposits her eggs when necessary, so that, by the aid of these comb foundations, the same work may be accomplished in a few days that might otherwise take months to do. A greater point still (which can only be appreciated by the progressive apiarist), is the benefit of always having straight combs. If you desire to raise drones (which is sometimes necessary) there are rollers made for that particular size of cells, which are larger than those of the worker's comb.

Should the apiarist desire to increase his colonies from ten to fifty in one season, to have altogether straight combs, and save labor and work to his bees, and gain at least fifty per cent. more profit, we say to him use the "comb foundation."

Bellows Smoker.—This useful little article was first brought to the attention of bee-keepers by the late M. Quinby, and it now seems altogether necessary to the successful management of the apiary. A few puffs of smoke from any of the modern or patent bee-smokers will quiet and subdue the most angry bees in a few minutes, so that they can be manipulated at will, without danger of stings to the operator.

Books on Bee-culture.—There are many interesting works that should be read by every bee-keeper. Amongst the most scientific and interesting are "The Hive and Honey Bee," by L. L. Langstroth; "Mysteries of Bee-Keeping," by M. Quinby; "The Dzierzon Theory," by Dzierzon, of Germany; "Cook's New Manual," by Prof. Cook, of Michigan; "The Bee-Keepers' Text-Book," by H. A. & A. J. King; "A B C in Bee-Culture," by A. J. Root, and various others, all of which are calculated to improve and enlighten even the most skillful apiarists. It is hardly necessary to mention the works of ancient writers, as they are not suited to the present progressive status of the world; but still we find in their writings some of the grandest encomiums that have ever been written of the honey bees, with rules for their management. Virgil said, "the bee is a ray of the divinity;" Plutarch, that "it is a magazine of the virtues;" Quintilian, that "it is the chief of the geometricians;" and De Montfort, that "the bee surpasses in architecture the skill of Archimedes."

Why Should we Keep Bees in Kentucky;—To enumerate all the reasons why we can and should keep bees in Kentucky, more profitably than elsewhere, would require more space than I can devote in this short article. I will merely mention a few reasons: First, our latitude is as favorable for the perfect growth of this insect as is to be found on this continent. Second, we have as much natural forage, either for food, honey, or wax, as there is in any other country. With a little labor we can produce an abundance of white clover and other plants, which supplied the first honey in the world. Our honey is noted for its pure whiteness, its almost perfect transparency, and a rich aromatic flavor that makes it delicious and unsurpassed. Another essential reason why we should keep bees, is the fact that bees fructify the flowers of fruit trees and plants in our orchards and gardens. There are few persons who have not sat and watched with wonder and pleasure the little bees as they fly from flower to flower; and while thus gathering the sweet food for their own little homes, at the same time diffuse the germs of life that serve to render perfect thousands of flowers that seem to spring up almost spontaneously. Prof. Darwin, in writing of white clover and heartsease, makes some curious statements. He says: "No bees, no seed; no seed, no increase of the flower; the more visits from the bees, the more seeds from the flower, the more flowers from the seed." He then mentions the following interesting experiment: "Twenty heads of white clover, visited by bees, produced 2,990 seeds, while twenty heads, so protected that bees could not visit them, *produced not one seed.*" If this wonderful phenomenon of nature be true, how much more necessary it must be for every farmer to keep at least a few colonies of bees, if only enough to supply his own family with this healthiest of all luxuries, which is offered to him by this industrious insect "without money and without price."

Statistics.—While I am unable to give the exact statistics for *every* county in our State, I have obtained enough reliable information to show how bee-culture and apiaries are increasing in Kentucky. In 1870, we produced 1,171,500 pounds of honey, and 32,557 pounds of beeswax; in the following years, and up to the spring of 1877, there was little, if any, increase; in the spring of 1877, we find in Kentucky an average of 75 bee-keepers in every county, making 8,700 bee-keepers in the State, and an average of 600 colonies to each county, producing an average of 35 pounds to the colony, making 2,430,000 pounds of honey, and 35,500 pounds of beeswax.

The great interest that has been taken in bees this year (1878) will largely increase the above calculation, an increase greater than in any other one year. To further show the rapid increase of bee-keepers all over our confederacy of States, I will say that, in 1870, there were about 70,000 bee-keepers in the whole United States; this year there are not less than 150,000, averaing 15 colonies each, while the revenue derived from this source alone is no small item in the wealth of our nation. There is no telling to what magnitude this industry or business of pleasure and profit may grow in future years, particularly if our farmers and gardeners will look to their own interests, and if the people will study the habits of the bee, and adopt the late improvements in breeds, hives, and scientific methods in managing apiaries and honey.

The National Bee-keepers' Convention publishes the following:

FACTS FOR THE PUBLIC.

"The National Bee-keepers' Convention, in session at New York, October 16th to 19th, 1877, aware of the general lack of information concerning improved methods of apiculture and its products, respectfully submit the following statement of facts for general information, concerning a large source of personal and national revenue, in preserving the honey which God has caused to flow so abundantly in the vast and varied flora of our country:

"1. It is now only a few years since the invention of *movable comb hives* has opened up a new era in bee-keeping, and placed it on the basis of a successful business pursuit. Such hives, adapted to climate, furnish every facility for intelligent management of bees by regulating swarming, guarding against moths, and manipulating both bees and comb.

"2. The inventors of the *extractor* or honey-slinger, a machine which empties the honey by centrifugal force, without injury, so that the combs may be returned to the bees, marks another great step in apiculture. Thus virgin honey, free from foreign admixture, is obtained, having the flavor of the flower from which it is drawn.

"3. The further invention of artificial comb foundation, made of pure wax, first successfully used to a large extent this season, completes the requisites for placing bee-keeping on the basis of a great industry in our country. Bees receive this artificial comb foundation with readiness as receptacles both for honey and brood.

"4. Simultaneous with the first and all of these improvements, the introduction of *Italian bees*, and improved modes of rearing queens, of transporting and introducing them to colonies, has greatly improved the value of the honey-gatherers, both because of the superiority of the Italian bee and introduction of new blood. New blood prevents the danger from in-and-in-breeding.

"5. The great drawback to apiculture is the *sting* of the bee. Danger from this source is now largely overcome by the simple appliances used for the protection of the person and for subduing the bees. The most vicious colony may be subdued in a very few minutes.

"6. To consumers of honey, a few facts are necessary in this article to preserve them from imposition. Nice white comb speaks for itself, and is generally admired; but the price many lovers of honey cannot afford. It makes a beautiful dish for the table, but is no better than *extracted* honey. All comb is wax, and wax in the stomach is perfectly indigestible. Extracted honey is the pure liquid honey, as it is taken from the combs by the honey-slinger, free from any foreign admixture. It is entirely different from what is known in this market as *strained* honey. Consumers help to impose upon themselves by the false idea that pure honey will not granulate. They desire ungranulated honey, and dealers will attempt to supply the demand. Almost all pure honey will granulate when exposed for some time to light and cold. The granulated state is a fine evidence of pure honey. Much of the jar honey heretofore sold in the markets, and recommended not to granulate, is a very inferior article, composed largely of glucose or some inferior substance. Granulated honey can be reduced to its liquid state in a few moments by placing the jar in warm water. When thus liquefied, it so remains for some time before again crystalizing. Consumers may be sure of a good wholesome article by purchasing granulated honey and reducing it.

"7. To producers. By full use of improvements in bee-keeping, the honey crop of America may be almost indefinitely increased and become a great source of national revenue. None need fear over-production. The home demand and consumption is largely increased whenever people learn to know the superiority of such honey. Dealers in New York have already commenced a large export trade, and they tell us that their only difficulty is in procuring honey in proper shape and quantity to supply the growing demand. Trade demands that they be put up in nice, attractive packages, and in small parcels or jars, so as to be readily handled by grocers and consumers. Honey was for centuries the prinpal sweet known, and is one of the most healthful of all. Improvement in refining sugars have, within the last two or three centuries, led to its general adoption. Why may not also new improvements in apiculture restore it to its true place as a general favorite, which was lost by bad management and the consequent corresponding limited supply?

"We believe that improvement in bee-keeping, as compared with old methods, is not less than those in railroads and steamboats, as compared with former modes of travel.

"For mutual information, we would advise the organization of local societies and conventions to further this business among all interested in apiculture.

J. H. Nellis, *President.*

Thos. G. Newman, *Secretary.*

UNION BEE-KEEPERS' ASSOCIATION.

This Association met at Shelbyville, Kentucky, on the 17th of October, 1878.

The President of the Society, Dr. L. E. Brown, of Eminence, Kentucky, called the meeting to order, and presided over its deliberations.

Mr. Fred. Krueger made an extemporaneous statement on the best way to prepare honey for the market. He thought small boxes were the most convenient, but was in favor of extracted honey for profit. He spoke at considerable length of artificial honey, which even some bee men engaged in, and deprecated the idea of feeding bees artificial honey.

Mr. N. Cutting announced that he would produce, at the next meeting of the Association, an artificial honey of his own manufacture, and would challenge any one to detect the difference between it and the genuine honey.

Dr. Brown stated, that in preparing honey for market, it should be put in frames. It would thus sell better, and be more readily disposed of at better figures. He gave some valuable information as to the best make of frames used. Bees will fill a box of twenty pounds as quick as one of ten. The gumming of the frame is what occupies most of the time of the bees. It took bees longer to make one pound of comb than ten pounds of honey. Comb honey was preferable for market. The machine used in extracting honey was calculated to thin it, but by sitting awhile it would resume its proper thickness.

Mr. Krueger insisted that all extracted honey goes through fermentation at some time. Comb honey does not ferment unless broken.

On motion, a committee was appointed to obtain the essay of Dr. E. Drane on "Artificial Swarms," and, if worthy, request its publication.

The attendance was quite small, owing to the hard rain that prevailed nearly all day. A number of members who had prepared essays for this meeting were unable to attend.

On motion, the Convention adjourned to meet at Eminence, on the first Thursday in April, 1879.

SOUTHERN KENTUCKY BEE-KEEPERS' ASSOCIATION

This Association held its annual meeting on the first Friday and Saturday in November, 1878, at Bowling Green, Kentucky. The Convention was well attended, and much interest manifested by the members. The following subjects were brought forward for discussion during the sessions of the body:

"Who should keep bees, and how should they keep them?"—Opened by a fifteen minutes' speech by W. Cook and Dr. Whitlock.

"Artificial swarming"—James Ervin and N. P. Allen.

"Transferring bees"—W. T. Sears and N. Holman.

"Overstocking"—N. P. Allen and J. G. Allen.

"Best location for bees"—I. N. Grear and J. M. Holman.

"Which will pay best, comb or extracted honey?"—Discussed by W. W. Wright and R. A. Alexander.

"How to winter in this climate"—J. D. Davis and Jo. Adams.

"How to carry through the spring"—A. Simmons and H. W. Sanders.

"History of bee-culture"—Wm. L. Dulaney and J. G. Allen.

"Artificial comb foundation"—N. P. Allen and J. D. Davis.

The Committee of Arrangements for the Convention consisted of L. P. Smith, Dr. Whitlock, and Robert Munford. Bee-culture is a subject of growing interest in Kentucky, and is enlisting the attention of many of the most prominent men in the "Green River Country."

The officers of the Association are Dr. N. P. Allen, President, Smith's Grove, Kentucky; H. W. Sanders, Secretary. There are several very fine aparies at or near Bowling Green, and many skillful bee fanciers, among whom may be mentioned Hon. Wm. L. Dulaney, W. T. Sears, Dr. S. Johnson, W. Cook, and others.

LOGAN COUNTY FARMERS' CLUB.

This institution is composed of many of the best agriculturists of Logan county. They hold regular meetings, at which essays are read, speeches made upon selected subjects, and discussions had upon a great variety of topics of interest to the farmers and horticulturists of Logan county. At a meeting of this Club, the subject was proposed for discussion:

"EDUCATION OF FARMERS' SONS SO AS TO RETAIN THEM ON THE FARM."

The above question being under discussion, William Morton, the President of the Society, said: A very important problem, but one not easily solved. Education, as is generally known, does not commence at the time a boy enters a school-house or college, but as soon as the child is old enough to notice; and if a boy is intended for a farmer, his education should then commence. He should be accustomed to go out into the barn-yard and assist, as soon as he is old enough, in handling, feeding, riding, and working the stock of all sorts; thus, in early life he will acquire a fondness for farm pursuits. Unless you can create in him a fondness for such pursuits, it is in vain to attempt to make a farmer of him—love of occupation being the most potent engine of success in any calling. After having done all that can be done to create in him a fondness for the profession you design him to follow—and farming is a profession—he must then be taught habits of industry; make a boy industrious, and nine tenths of his education is accomplished. Industry accompanied by enthusiasm, in whatever a man or boy undertakes, will work wonders. A boy thus awakened, no human power can prevent from success in life. These two things—love of occupation and industry—being instilled as early as possible, the boy is then ready for his scholastic education, which should be thorough and complete.

No occupation requires more varied learning than that of the farmer. Philosophy, chemistry, history, botany, geology, mineralogy, the classics, and mathematics are all necessary for a farmer's education—all calculated to inspire him with a love of his calling, and afford him assistance, and give him moments of pleasurable delight when not engaged in actual work. Some may say a boy has got no time to spend in "poring over books," if he wants to make ends meet and pay his taxes. It can be done by economy of time and industry. Let the twenty-four hours of the day be divided into three parts—eight hours for study and amusement, eight hours for labor, and eight hours for rest and sleep; or ten hours for labor, four hours for reading and study, and ten for sleep; but eight hours, one third of a man's lifetime, is enough for any man to sleep. Napolean Bonaparte slept from two to six hours—never over six—in the twenty-four. I don't believe in a boy wasting one third of his life in a school-house. All the good the schools can do, is simply to teach him how to study. After learning how to study, by dividing his time as above suggested, he can work and study at home, and, by industry, will succeed. If you want a boy to stay at home, you must make your homes attractive; you must beautify and adorn them. Make the boy more comfortable at home than anywhere else, and he will stay there. Let him have all sorts of innocent amusements around him—his horn and hound, his horse and saddle and fiddle—all to be used at the proper time, but not during the hours of labor. Instill into him principles of patriotism; for nothing makes a man love and cling closer to home than a natural love of the soil upon which he lives. Let him know that it is his duty to take a lively interest in the political welfare of his country; that he has a right to a voice in its management, and that it is his duty to exercise that right; and he should be so educated as to know how to exercise that right. While his body is employed upon the farm, his mind should have something to feed upon. In every neighborhood there should be a Farmers' Club, Thespian Society, or a Debating Society, or something of the sort, to accustom the boys to public speaking, and to familiarize them with parliamentary law; so that, when they go to town on convention days, &c., they may know how to do and how to act, and when to strike to carry their points, and not leave the country to be controlled entirely by pot-house politicians. It is absolutely necessary for the farm boys to be able, as soon as they are old enough, to elect the men of their choice for the various offices when they desire to do so.

If our State and National Legislatures had a greater proportion of farmers in them, the country would be more prosperous. All classes should be represented in our legislative bodies; but the agricultural interest more largely than any other, because agriculture is the foundation stone upon which everything else is built. The boys should be trained in the belief that they are always to be farmers; that they are not to try farming to-day, speculation to-morrow, and patent rights next day, but farmers for life. Let each one struggle for the mastery in his profession; let each try to be the largest farmer in the country; if not the largest, then the best, just as that matter is managed in other professions. If he can make a profit on one hog, he can double it with two; if one acre will make a profit of ten dollars, two will pay twenty; let him be grasping; let him reach out; let him acquire more territory, and when acquired, let him master it by himself or tenants. Let him look back at those old farm estates in Virginia, which have been there in the same family since the days of Queen Elizabeth. Let such be established here, and the boys must see that they don't pass into other hands.

Let the men of energy and enterprise control and govern the country, and drive out the laggards. If a man dies leaving a large landed estate to his son, if he has not pride enough to keep it, or industry enough to work it, let him sell it at once, and sneak off into some little inland town, and fritter away the proceeds on wine, women, and tobacco,, and die before he gets too poor to pay for his coffin. No matter how poor a boy is, if the principles of industry are instilled into him, no power on earth can keep him from learning.

Our present common school system affords an opportunity to any boy to get the rudiments of an education; and if his parents have taught him industry, he will do the rest. It is all important that the teachers of our common schools should be competent; and before a teacher is foisted upon a neighborhood, in addition to the too easily obtained certificate of qualification, he should be required to undergo the rigid examination of three of the most competent men in the neighborhood, who are directly interested, before he is allowed to teach. The teacher should have good common sense, as well as book learning; he, too, should be industrious, and if he is lazy, discard him at once; if he sleeps late, lounges about, don't divide and economize his time right, and don't teach the children to do the same, he is unfit to teach, and will set such a pernicious example before the children as will do them a positive injury. The country is now greatly injured by trifling, would-be school teachers—too lazy to work, and unfit to teach. A thorough reformation by school trustees, in selecting good teachers, will greatly facilitate the education of poor children, who are unable to get a more liberal one than our common schools afford. Upon parents the greatest responsibility rests in the education of their children.

I again say, teach them industry by precept and example. It is the key-note of success. Teach them good morals. Instill into them a tractable but not subservient disposition, and the balance of their education is easily accomplished. The main object of this discussion is to induce the boys to stay on the farm. This will be easily done, if, in early life, they are trained to habits of industry, virtue, and sobriety. An example of such training is that of George Washington, who said at the close of his second term, that "he would rather be on his farm than emperor of the world." Does it pay better to farm than follow some other calling? By careful management, industry, and economy, farming will pay as well, if not better, than any other occupation; but not so if the farmer spends half of his time in going to sales and to town on court days when he has no business; not so if he lives too high; not so if he drinks to excess or gambles. If he will be moderate and simple in his diet, it will put money in his purse, and he can go out with a clear head to the performance of his daily toil. We, as farmers, try to live too easy. If a lawyer loiters on his way to court, and don't get there in time, his client loses his case and his confidence in his attorney. If a doctor is not expeditious, his patient will die. He must not stop for sunshine or darkness if he wants to succeed; neither must a farmer work only half his time, and then say farming don't pay. Farming being the chief corner-stone of all other occupations, as no country is prosperous unless her agriculturists succeed, it should therefore be fostered and protected by law, and our law-makers should annually make bountiful appropriations for the full development of our agricultural resources. More energy and less croaking is what we as farmers want. Our surplus money should be spent in acquiring more land, or in beautifying and enriching what we have, and making ourselves and our families more happy and more contented at home. For no occupation presents a more certain way of securing an independent living, a more pleasant road to peace and prosperity, or a more desirable way to contentment here and happiness hereafter.

KENTUCKY AGRICULTURAL AND MECHANICAL ASSOCIATION.

The second fair of this Association was held at their Fair Grounds, near Lexington, Fayette county, Kentucky, on the 27th of August, 1878, and continued five days.

This is one of the best organized Associations in the United States, and one that every year brings together the finest collection of live stock, and farm, orchard, and garden products in America. This year over $6,000 were given in premiums. The attendance was very large, and the display of everything most excellent. The dinners and refreshments were such as are always to be found at Kentucky fairs, presided over, as they are, by the beautiful, energetic, and industrious ladies of this central bluegrass section of our State, whose grace and hospitality are known and appreciated wherever the name of Kentucky is spoken.

This second fair was a success greater than that of last year, and fulfilled every anticipation which was indicated by the directors and managers when they issued their pamphlet list of premiums, and published to the world the following

"INTRODUCTORY REMARKS.

"It is with a feeling of pride and pleasure that the officers of the Kentucky Agricultural and Mechanical Association (new series) present this programme for their second fair. The very brilliant and encouraging success met with at the opening exhibition last year is held as a pledge to be relied upon that the coming event will lack none of the pleasing attractions and interest with which the first was surrounded. As evidence that our first exhibition was an entire success, we need but refer to the fact that the gate receipts for a single day exceeded those for a whole week of the old fair when in the full tide of its great popularity. With an enlarged experience and redoubled efforts, encouraged by the liberal patronage bestowed upon their enterprise in its infancy, the Association feels justified in giving confident assurance that the meeting this fall will possess additional attractions that cannot fail to give the amplest satisfaction.

"As to the moral conduct of the exhibition, they need only refer to the first meeting. If possible, greater safeguards will be used in the future than on that occasion. Drunkenness or disorder of any kind will not be permitted. In addition to the presence of the officers, a police force, fully sufficient to prevent any evil growing out of bad behavior, will be on the grounds from the opening to the close of each day's exhibition. Betting of any character will positively be prohibited on any part of the grounds.

"Such improvements as may have been suggested to be necessary at the first meeting will be made. No expense or labor will be spared.

"Located, as our grounds are, in the very heart of the Bluegrass region, of world-wide fame, there could be no more *eligible* point for an annual reunion of those who are mostly devoted to stock-raising and agricultural interests generally. Those who have stock for sale, or who wish to purchase, could find no better or more profitable place to assemble. Our first exhibition attracted visitors from all quarters of our broad country from Maine to California. We confidently anticipate quite if not a larger attendance at our meeting of this year.

"Notwithstanding the numerous well-constructed stables already on the grounds, an additional number will be erected equally substantial, so as to accommodate all who may require good quarters for stock.

"Our *water facilities* are unlimited for all purposes.

"The show of *Racing and Harness Stallions* on this occasion will be, perhaps, the grandest ever witnessed on this continent, as we have assurances that at least fifteen or twenty of the most noted known to the turf will be present.

"The display of magnificent *Cattle, Hogs, and Sheep* will be on an extended scale, not to be surpassed in any State or country.

"The arrangement for a beautiful *Floral Display* will be liberal and ample. This department has attracted no little attention at home as well as abroad, in evidence of which the celebrated florist, Mr. Jas. Vick, of Rochester, New York, offers four premiums, amounting to $20, for the best exhibition of flowers by amateurs. Our sister cities, Louisville and Cincinnati, will doubtless contribute liberally to beautify this delightful department.

"The poultry department will form no unimportant feature to the general attractions.

"There will be an unusually large exhibition of the newest inventions in the way of farming implements, with all manner of agricultural products.

"The grounds embrace sixty-two acres of choice land, two hundred and twenty-five yards from the Cincinnati Southern Railroad depot, between the Versailles and Harrodsburg pikes. They are accessible from all points by turnpikes and railroads. Special arrangements will be made with all railroads entering the city to convey passengers from all directions to the fair. An avenue sixty feet in width, running through from Broadway to the Versailles pike, affords a grand entrance from either road.

"The trotting track is justly accounted the best in the United States. The first and last quarters are sixty feet wide, the other two, forty feet in width. The highest grade is eight tenths of a foot to the one hundred feet.

"The amphitheatre, beautiful in architectural structure, with tasteful ornamentation, is capable of comfortably seating five thousand persons, with airy promenades affording ample standing room for as many more. Underneath are neatly furnished dressing-rooms for ladies, officers' rooms, private and public dining-rooms, baggage-room and booths.

"*The Premiums* offered will be found liberal and worthy of a large and spirited competition.

"With the assurance of a kindly reception and hospitable entertainment, all are cordially invited to attend our great fair of 1878."

The articles on exhibition, as well as the stock and agricultural implements, &c., of all kinds, came from several counties throughout the blue-grass section of the State, as well as from other States. Perfect order and system prevailed in every department, and the premiums were adjudged to the satisfaction of all parties in attendance. Probably there never was a fair in the United States where a greater number of the most finely bred horses, cattle, sheep, swine, and poultry were exhibited than at this second exhibition of the Kentucky Agricultural and Mechanical Association.

There were no addresses, essays, or discussion reported which were delivered before this Society. In conducting the affairs and meeting of this Association, the officers enforce the following

RULES AND REGULATIONS.

1. Every article or animal entered for competition shall be under the control of the Board of Directors, *but the Association will in no case be responsible for any loss or damage that may occur.*

2. Competition open to all except when otherwise stated.

3. All stock except fat cattle to be exhibited by halter, in harness, or under saddle.

4. The gates will be closed in ten minutes after the ringing of the bell.

5. All premiums to be paid in cash.

6. No betting, gambling, game of chance, side shows, shooting galleries, &c., will be allowed on the grounds. Any person detected in betting on any part of the grounds, or found drunk, shall be expelled from the premises.

7. Objections to the judges must be made in writing to the President.

8. If in the opinion of the judges an entry is not consistent with the requirements of the preminm list, they must call on the Superintendent of the Department for information.

9. Premiums will not be awarded to barren animals in breeding classes. All animals of the following ages must have produced a live

offspring in the past two years; mares, 6 years; cattle 3 years old and over must be milking or in calf; sheep, 3 years; sows, 2 years. The above provision in regard to mares shall only apply to those shown in the blooded, saddle, and harness rings.

GENERAL PROVISIONS.

SEC 1. The Board may expel any member from the Society for rude, or disorderly, or ungentlemanly behavior at any of its fairs or meetings.

SEC. 2. Spirituous liquor shall not be sold or drank upon the grounds of the fair.

SEC. 3. The Board shall appoint such subordinate officers as may, in its judgment, during a fair, be necessary to preserve order, and to promote the general interest of the Society.

SEC. 4. The Board shall by resolution regulate and fix the terms of admission to any of its fairs.

SEC. 5. Every article or animal upon the grounds for exhibition shall, during the continuance of the fair, be under control of the Board.

SEC. 6. No loose animal shall be admitted into, or remain upon the grounds of the Society, during a fair, except by consent of the committee of arrangements.

SEC. 7. All entries for exhibition must be made with the Secretary before 11 o'clock, A. M., of the day of exhibition. This rule will be strictly adherred to.

SEC. 8. No barren animal shall compete in a breeding ring for a premium with one that breeds.

SEC. 9. No premium shall be awarded when but one animal, or one article, is exhibited, unless the judges shall be of the opinion that the animal or article, as the case may be, is worthy of a premium.

SEC. 10. Pedigrees of thorough-bred hores shall be given to the Secretary, for the purpose of being submitted to a committee appointed by the Board of Directors, who shall determine whether or not the animal is entitled to entry as a thorough-bred; and no animal shall be exhibited in those rings until a favorable report is made.

SEC. 11. No one shall act as judge if related to a person competing for a premium.

SEC. 12. Judges shall be appointed at least one month prior to the annual fair, and shall immediately thereafter be notified thereof by the Secretary. Vacancies to be filled at any time by the Board.

SEC. 13. Each judge shall form his own decision, without conferring with any other judge or person; and, when his opinion is formed, shall report his judgment to the person appointed to receive it, first for premium, and, when that is decided, for certificate. A majority of all the judges shall be necessary to award a premium; and when the regular judges fail to make a decision, other judges shall be called in, until the award is made.

SEC. 14. Whenever a premium is awarded by the judges, public proclamation shall be made of it by the marshal.

SEC. 15. The Secretary shall, after each fair, make to the Board a report in full of the premiums awarded, which report, with such other matters as the Board may order, may be published.

SEC. 16. All animals or articles exhibited for premiums shall be shown by numbers, of which the Secretary shall keep a register.

SEC. 17. The owner of the stock shall hand to the groom of any animal a memorandum of the age of such animal, to be delivered to the judges, when offered for exhibition.

SEC. 18. Any disrespect shown or manifested towards the judges by any exhibitor, or his or her agent, because of their award, shall, so soon as known, be visited with instant expulsion from the grounds, and shall forever debar the party from the privilege of an exhibitor; and if a member of the Society, shall forfeit all privileges; provided the offender may be granted the privilege of an explanation and apology, which shall be as public as the offense.

SPECIAL SPEED RINGS.

1. All trials shall be governed by the rules of the National Association.
2. All entries must be made on or before August 1st with the Secretary.
3. An entrance fee of 10 per cent. will be charged on the premium, and must in all cases accompany the entry. Should the ring not fill, the entrance fee will be returned.
4. In all rings 5 to fill, 3 to start.
5. Any horse distancing the field shall receive only first money.

ENTRANCE FEES.

An entrance fee of one dollar will be charged all animals entered for a premium of ten dollars and up to twenty.

All entered for premiums of twenty dollars and upwards to pay two dollars.

Any person who shall have paid five dollars as entrance fees shall not be charged any farther.

All entries for premiums under ten dollars free.

All animals that have paid fees in regular ring shall enter sweepstake and champion ring free.

Any person entering more than one animal in any one class shall only pay one entrance fee.

The following is the list of officers for the year 1878:

President—R. T. Anderson, Lexington, Kentucky.

Vice President—R. J. Spurr, Lexington, Kentucky.

Directors—John R. Viley, Lexington; R. W. West, Scott county; A. J. Alexander, Woodford county; William Warfield, Lexington; W. W. Estill, Fayette county; B. F. Vanmeter, Clark county; G. B. Bryant, Jessamine county; J. G. Kinnaird, Chilesburg; W. T. Withers, Lexington; Leslie Combs, jr., Lexington.

Treasurer—E. D. Sayre, Lexington, Kentucky.

Secretary—James L. Lisle, Lexington, Kentucky.

KIRKSVILLE FAIR ASSOCIATION.

The yearly fair of this Association was held near Kirksville, Madison county, on the 19th and 20th of July, 1878. This was the first county fair held in the State during the year. I am indebted to Colonel C. C. Chrisman for the following report of this meeting: In reference to the Kirksville Fair, he says: "It was held near two miles from Kirksville, in the beautiful woodland pasture of Mr. Thompson Burnam, on the Kirksville and Kentucky River Turnpike. The premiums of the Association amounted to about $500. The show of stock was very good, especially the display of horses. The exhibition of hogs was splendid, the owners of all of them contesting the merits of the different breeds; of these, the most notable were the Berkshires, Poland China, and Spanish Red. The Spanish Red were first imported into the United States by Hon. Cassius M. Clay, of Madison county. They are a class of hogs easily fattened, rapid growth, and good size; their name indicates their color.

The display of sheep and cattle was tolerably fair. The interest taken in cattle by our citizens is on the increase, which will no doubt be of great benefit to our people. The cattle industry, on a proper basis, is a most remunerative branch of agriculture in our county.

The success of our fair was greatly due to the ladies of Madison county, who, with the noble, generous, and hospitable traits for which they are distinguished, came forward and presided over tables groaning under the loads of every good thing which a hungry man could desire.

No other people in the world can beat our women in "fixing up good dinners," when they set their heads to work in that direction, as was evidenced to the full satisfaction of every person who attended the Kirksville Fair this season.

We had nice weather and good order throughout the entire fair meeting, and everybody seemed to enjoy themselves finely, and to be well pleased with the awards of premiums, and the general conduct of all the officers and attendants upon the ground."

The officers of the Association are—

President—W. P. Prewett.

Vice President—Dr. W. C. Montgomery.

Secretary—M. L. Duerson.

Assistant Secretary—Thompson Burnam.

Directors—Jas. Shearer, Wm. Shearer, S. P. Ross, D. C. Curtiss, John B. Parkes, Thomas Ramsey, and C. P. Embry.

Ringmasters—James Burnsides and Chas. Chrisman.

Chief Marshal—Wm. A. Finnell.

Assistant Marshals—John Fowler, Samuel Carpenter, and George Farris.

CHRISTIAN COUNTY AGRICULTURAL AND MECHANICAL ASSOCIATION.

The annual fair of this Association was held at Hopkinsville on Thursday, Friday, and Saturday, the 3d, 4th, and 5th of October. The display of all kinds of stock, agricultural and horticultural productions, and manufactured goods, farming implements and machinery, was fully equal to that of any former year. The premiums were judiciously awarded, and everything passed off harmoniously, and greatly to the satisfaction of the citizens and stockholders. Hon. James O. Ellis, the Secretary, says: "We are through with paying off the expenses and premiums of our fair, which closed on the 5th of October. The receipts of money at the fair will fall short of the disbursements about one hundred dollars, which, under the circumstances, we regard as a grand financial success; while there has not been a case of 'yellow fever' in our town or county, yet there were false reports and rumors through the country, that kept at least a thousand people away. We had a fine exhibition in nearly every department. We had stock from (Danville) Boyle county, Ballard county, and several other counties nearer home in this State, and also from Robertson, Montgomery, Sumner, and Madison counties, Tennessee, &c., &c." There were no addresses, essays, or discussions on agricultural subjects before this Association this season. The officers of the Association not reported.

ELM SPRING AGRICULTURAL, HORTICULTURAL, AND MECHANICAL ASSOCIATION.

The seventh annual fair of this Association was held at their Fair Grounds, near Mt. Carmel, Fleming county, Kentucky, from July 30 to August 3d, 1878. I am indebted to W. R. Darnell, Esq., Secretary, for the following report of this flourishing Society:

Elm Spring is situated near Mt. Carmel, Fleming county, and takes its name from a very fine spring of pure cold water that flows from a small rise or elevation, situated in one of the most beautiful groves of natural forest trees in Kentucky. This grove consists of second growth trees from 50 to 75 feet high, that so perfectly shade the grounds in summer as to appear like a natural arbor. The growth consists of elm, ash, oak, poplar, maple, walnut, locust, hackberry, and many other varieties. Overhanging the spring is a mammoth elm tree more than four feet in diameter, over fifty feet tall, and with large outreaching branches, extending over a circuit of ninety-six feet. It is from this elm and the spring that this beautiful spot takes its name.

The "Elm Spring Agricultural, Horticultural, and Mechanical Association, of Fleming, Lewis, and Mason Counties," was chartered at the session of the Legislature of 1871–'2, and its capital stock was soon after all taken and paid in, amounting to $3,500, by 21 stockholders.

This corporation owns its Fair Grounds, upon which they have erected a permanent amphitheater well covered, with elevated seats, so arranged that all the spectators can see every part of the ring. There is above the seats a wide promenade 12 feet in the clear. The arena is 200 feet in diameter, and perfectly level. The floral hall is large and commodious, and well arranged for the display of all kinds of manufactured home-made goods, flowers, garden and orchard fruits, and dairy products. The ladies' cottage is large, convenient, and tastefully arranged, near which is one of the finest wells of ice-cold pure water to be found in the State. In the centre plot of the cattle stalls (144 in number) is a large pool of pure water for stock of all kinds. The stock stalls are all free to exhibitors, and kept in perfect order by the Association.

The 7th annual fair was in every way a success. The best of Short-horned cattle, horses, sheep, swine, jacks, jennies, poultry, and farm products were entered from Fleming and the adjacent counties. Horses from seven or eight counties contended for prizes. The floral hall was well filled with flowers and all kinds of products of the garden, the orchard, and the dairy, as well as with fine needle-work, and home-made goods. No nicer display was ever made in this department than what was exhibited this season. The articles came from nearly all the counties of Northeastern Kentucky, and some from other States. Agricultural machinery and farming implements were well represented. The crowd was large, and the premiums were adjudged to the satisfaction of all parties. The dinners were excellent, and the ladies fairly outdid themselves in their hospitality and good cheer in providing every luxury for the tables. Everybody was pleased, and good humor and cheerful happiness marked the countenances of all the participants in the joys of the occasion.

UNION AGRICULTURAL SOCIETY OF MASON AND BRACKEN COUNTIES.

The twenty-fourth annual fair meeting of this Association was held at their fair grounds, near Germantown, Mason county, Kentucky, on September 10th, 11th, 12th, 13th, and 14th, 1878. The attendance was large, and the fair in every way a success. The live stock from several counties in Kentucky and Ohio was exhibited, and a spirited contention for prizes was carried on during the five days. The agricultural implements on exhibition were very fine, and the farm, garden, and orchard productions excellent.

The following are the rules and regulations of this Association:

No charge for entries.

All entries for stock should be made by 10 o'clock on the day of exhibition. If the entry be an animal under one year, the precise day of its birth shall be given.

The gate of the amphitheatre will be closed in ten minutes after toll of bell for each ring of stock.

All stock presented for exhibition shall be under control of the marshal.

No aged animal, that has taken a premium from this Society, shall again compete for the regular prize, unless in a sweepstake, without regard to age; and no animal, which has taken a sweepstake or other prize, shall again compete for the same prize.

No animal will be allowed to compete for more than one premium, except in the sweepstake, herds, and special rings; but horses will be allowed to compete in all appropriate regular rings until they have taken one premium, after which they will be excluded from competition, except in herds, sweepstakes, and special rings.

Where there is but one entry made of any description, and the judges do not consider it worthy of a premium, they shall so report, and no premium will be given.

No owner of stock will be admitted in the ring when contending for a prize, except when they are in charge of said stock. Ownership of stock withheld from the judges.

Exhibitors of articles in the hall shall make their entries before 12 o'clock on Tuesday. The committee will make their awards Tuesday, after dinner. Any three of the judges can act and make the award. The doors of the hall will be opened to visitors Wednesday morning.

All articles placed in the hall or mechanical department cannot be removed until Saturday, except by permission from the President.

No entries of articles or stock shall be made by a company without giving the name and residence of each member of the company, and each member of said company must have a joint ownership in each article or stock shown.

All articles having taken the premium at an exhibition of this society are excluded from competition at any subsequent fair.

Persons exhibiting articles in the hall shall elect at time of entry in what class they will show, and shall show in no other.

The Secretary will be on the grounds on Monday preceding the fair, for the purpose of making entries.

In the mechanical and household department, no person but the manufacturer, or his regular authorized agent, will be allowed to exhibit.

The premiums will be paid in currency, unless otherwise provided for in the list.

Any person purchasing an article (except flowers), and exhibiting the same as the grower or manufacturer of such articles, shall be excluded from the privilege of exhibiting anything hereafter at any of the fairs of this Society.

No person connected with the booths or shows, except the real owners, shall be admitted to the grounds without paying the regular admission fee at the gates.

The Board of Directors may expel any member or other persons from the Society for rude or ungentlemanly conduct, at any of its fairs or meetings, or for fraud, or attempt at fraud or misrepresentation, with regard to stock or articles offered for competition.

All premiums awarded, which are not called for by the first day of November, will be forfeited to the Society.

The exhibition will open at 10 o'clock each day.

No omnibus, carriage, hack, or other vehicle, running for hire, can enter the grounds, but shall discharge and receive passengers at the footman's gate.

The stalls are free for stock on exhibition; but, without permission from the Society, no animal will be allowed the use of a stall, except on the day on which it is to be exhibited. Any one entering stock, and taking a stall, and shall fail to exhibit the animal, will be charged $4 a day for use of said stall.

The directors and officers of the Union Agricultural Society are:

President—Evan Lloyd.

First Vice President—Col. L. J. Bradford.

Second Vice President—W. T. Sallee.

Third Vice President—W. W. Orr.

Secretary—J. M. Nolin.

Treasurer—Darius Norris.

Mason County Directors—Henry Smoot, W. W. Baldwin, Madison Worthington, James C. Savage, Col. Sam'l Forman, John Mannen, Daniel Norris, and Robert Terhune.

Bracken County Directors—W. R. Galbraith, Abner McClanahan, S. L. Tollman, J. W. Jennings, Dr. J. H. Holton, H. T. Lloyd, and S. W. Bradford.

Superintendent—Thirman Pollock.

Marshal—P. H. Clayton.

ANDERSON, FRANKLIN, AND SALVISA AGRICULTURAL AND MECHANICAL ASSOCIATION.

This Association held its sixth annual exhibition at the Fair Grounds at Lawrenceburg, Anderson county, beginning Tuesday, August 13th, and continuing four days. The annual meeting of the stockholders is held at Lawrenceburg on the second Tuesday in April of each year.

The exhibition at the fair was a fine success. The stock of all kinds shown was equal to any in the State. The premiums were well adjudged, and the attendance large. The articles entered consisted of ladies' manufactures, strictly home made, such as jeans, linseys, flannel, carpets, blankets, &c., patch and needle-work, embroidery, quilts, &c.; flowers in pots and in bouquets; family produce, such as butter, cheese, cakes; garden products, field products, and fruits; mechanical articles, such as wagons, buggies, bridles, saddles, harness, agricultural implements and machinery, &c., &c.; live stock of all kinds, poultry, &c.

The fancy riding rings of both ladies and gentlemen were very fine, and the performances such as would compare favorably with those exhibited at any fair in the West.

The officers of this Association are:

President—Jas. F. Witherspoon.

Vice Presidents—O. R. Wheat and Holman Frazier.

Secretary—W. C. Nelson.

Treasurer—W. E. Bell.

Marshal—Lon Walker.

Ringmasters—A. Dawson and P. T. Nelson.

Directors—J. L. Dawson, Monroe Walker, J. W. Hickman, R. A. Hanks, J. T. Stout, Col. J. S. Burrus, Phil. Kennedy, Ed. Thomas, Gab. Gaines, W. B. White, and D. P. Hiter.

There were no addresses, essays, or discussion delivered before this Association.

MADISON COUNTY AGRICULTURAL AND MECHANICAL ASSOCIATION.

This Association held its annual fair meeting at the beautiful Fair Grounds near Richmond, Kentucky, on August 13th, 14th, and 15th, 1878. The attendance was large, and the exhibition of manufactured articles and fine stock fully equal to that of any other year. Excellent dinners were prepared by the energetic and accomplished ladies of Madison county, and everything passed off most pleasantly.

This is one of the best appointed Fair Associations in the State, and they have one of the best and most tastefully arranged Fair Grounds in the West; but as the clerk failed to give a detailed statement of the meeting, only a short notice can be here given.

The following are the officers of this Association:

President—Clifton Burgin.

Vice Presidents—R. B. Terrill, S. H. Stone, and Wm. Bennett.

Directors—Hugh A. Moran, Newland Jones, William H. Todd, C. R. Estill, J. W. Francis, John B. Parkes, Wm. T. Tevis, J. W. Embry, and June Walker.

Secretary—E E. McCann.

Treasurer—W. R. Letcher.

Assistant Secretary—Wm. D. Smith.

SHELBY COUNTY AGRICULTURAL AND MECHANICAL ASSOCIATION.

This Association held its eighteenth annual fair at their grounds near Shelbyville, Kentucky, on August 27th, 28th, and 29th, 1878. The annual meeting of the stockholders takes place on the second Wednesday in April each year. The attendance on the fair was large, and the live stock and other things on exhibition were fully up to the average of other years, both in quality and numbers. No report from the Secretary.

The following is a list of the officers:

President—Adam Middleton.

Vice President—W. L. Waddy.

Secretary—John Robinson.

Treasurer—M. T. Smith.

Directors—B. F. Bryant, M. Huffman, J. G. Byars, Henry Bird, A. B. Veech, Wm. Calloway, H. G. Cardwell, J. W. Freeman, E. A. Offutt, Samuel Kinkead, and Samuel Harbison.

DAVIESS FAIR COMPANY.

This Association held its annual fair on the 9th, 10th, and 11th of October, 1878, at their Fair Grounds, near Owensboro, Kentucky. This Society has one of the best appointed Fair Grounds in the State, and the meeting this year was a fine success; but particulars cannot be here given for want of a report from the Secretary or President of the Association.

The following is a list of the officers:

President—Dr. C. H Todd.

Vice President—Jerry J. Berry.

Treasurer—P. T. Watkins.

Secretary—Col. John H. McHenry.

Directors—H. W. Miller, W. H. Rogers, G. W. Simmons, J. W. Southerland, M. G. Mattingly, J. B Burton, and James Herr.

SIMPSON COUNTY AGRICULTURAL AND MECHANICAL ASSOCIATION.

The eleventh annual meeting of this Association was held at their beautiful, well arranged Fair Grounds, near Franklin, Kentucky, on September 26th, 27th, and 28th, 1878.

The fair was in every way a grand success; and the worthy Secretary, John B. Montague, writes that "we did not have any speeches, essays, or discussions delivered before the Association." The other officers' names have not been furnished, and no specific report of the proceedings.

HENDERSON COUNTY AGRICULTURAL AND MECHANICAL ASSOCIATION.

[Reported by "The Henderson Reporter."]

The eleventh annual exhibition of the Henderson Fair Company began on Wednesday morning, October 16th, under auspices, so far as human agency could control, exceedingly congratulatory and promising. The grounds, in point of natural attractions and location, were placed in admirable order, and afforded both exhibitors and visitors every pleasure to be desired. The first day of the fair, no matter how favorable the weather may be, or how attractive the programme may be arranged, has passed into proverb as a failure. The people seem either not to be thoroughly ready for the exhibition on that day, or else to hesitate before going. The first day opened with a strong wind from the southeast, and lowering clouds flying across the heavens. Rain seemed threatened every hour in the day, and the dust was blown about in clouds, filling the scene on the way like a mist. As a natural consequence, the attendance was very light, but of the number there were many ladies whose bright faces and tasteful costumes, and the interest manifested in events, added greatly to filling out what otherwise would have been but a medium showing for an amusement-loving people. Along, however, towards the time for calling the races, the crowd had perceptibly increased in size, and gave something like the sign of real life to the exhibition. The grounds were filled up with many of the usual features incident to the place and the occasion, though the absence of the *foreign* fat woman, the educated hog, and the chewing gum man, is to be remarked. These, fortunately for us, were not present, and no ear was dinned with the sounds of their remarkable merits (glibly told by a fluent representative), which would choose to give itself, undisturbed, to the music of the band or the merry hum of social converse.

The racing was the most interesting and exciting feature of the day. The first race was for the citizens' purse, a half mile dash. Six horses were entered in this, and all of them came to the scratch. They were Joe Rhodes, Matagorda, Birdie Norton, Woodford, Grey Pet, and Harry Todd, each looking well, their coats sleek and glossy, and from the moment of their first appearance on the track interest grew eager, and knowing ones nudged and nodded in small knots together. Rhodes, who sold a favorite in the pools, is a bay gelding, the property of Rob't Dixon of this city, is 16 hands high, and ran 1 1/8 miles at Lexington, in the spring of 1877, in the remarkably fast time of 1:56 3/4, beating the celebrated Mahlstick and other famous horses. Matagorda is a shapely little sorrel mare, and runs with all ease and a steady reach. She ran next to Dan K at Louisville last spring in splendid time, and has achieved other things sufficient to make her no slouch. Birdie Norton is a bright sorrel, 15 hands high, and has made quite an enviable reputation for herself at the fairs in this section this fall. She is a graceful mare, and decidedly a little beauty. Woodford and Grey Pet are both presentable animals, and our own horse, Harry Todd, is too well known to require any description at our hands. Matagorda won the race, coming under the string a length or more ahead in 52½ seconds, very fast time for the track.

The second race was for green horses. Seven showed up at the call from the stand; and, after some delay and one false start, which was something of a ruse in itself, the "Greeners" went off fairly well. Willis Bowles' bay mare Dinah won in 1:02½.

The attendance on Thursday was not, in any degree, gratifying in point of numbers, nor was it near so large, as with the fine day and the complete programme prepared, the company had every right and reason to expect. Still there was a marked improvement in this regard over the first day; and during the contests in the inside ring, the amphitheatre seats were moderately well filled, and exhibited something of an interesting and interested spectacle. Of those attending, we were pleased to notice quite a number of Evansville people, including several beautiful and handsomely attired ladies. The Henderson fairs have always been fortunate in the interest they were enabled to awaken in our Hoosier neighbors, and we are glad to note that this agreeable fact is true of the past exhibition, and particularly (though all are cordially welcome) in regard to the Hoosier ladies, who always have been, and are to-day, the objects of genuine appreciation in Kentucky, and especially in Henderson. Mingling with these, too, and making their usual attractive appearance, were many of our home ladies, who added greatly to the grace of the occasion. In contrast with this generous patronage on the part of the town people and strangers, the sparse attendance of the farmers and their families was to be remarked. It may be for reasons pertaining to the caring of their crops at this season; but, for some reason, certain it is that but very few of the country people visited the grounds, and the loss is as well theirs as the company's. Very especial attention was given to bringing together decidedly the most superior collection of stock that has been in Henderson for years. Several herds from upper Kentucky, from the section where breeding is made a business, were here, and should have been inspected by every stock man in the county. Besides these, the display in other regards was of a character to please the farmers particularly, and they should have been early alive to their interests.

Floral hall was thrown open late in the afternoon, and although it was not filled to the extent we had been led to hope it would be, still the articles were numerous, and the arrangement tastefully done. Of these, the vegetables, the cookery, and the needle-work, showed that rather lively competition had taken place; but an examination of the awards disclosed the fact that an excellent judgment had passed on the articles. The coops were all taken, and the fowls looked in the very best keeping, from the mammoth sizes to some of the most diminutive we have ever seen.

On Friday the weather, though clear, was raw, and the afternoon positively cold. A west wind blew all day, and increased in strength until shawls and overcoats were the rule, and people shivered even while promenading. Yet the attendance was larger than any previous day, and the interest manifested was highly gratifying to both the directory and the exhibitors. The rings were large, and the awards elicited many compliments on the judgment exhibited The show of horses was very fine, and our own home stock captured many ribbons. In this connection we wish to say that the Henderson horses show up very creditably in comparison with the picked stock from abroad, which plainly tells of the advancement in the matter of improved breeding which has been made here in the last half dozen years. The get of Robert Dixon's horses, particularly, have been remarked on for superior parts.

A notable object of interest in the floral hall display was a quilt said to be three hundred years old; and for that time has been handed down in the family of which Dr. Thos. Taylor is now the scion. It is, as may be supposed, of a very singular pattern, and very unlike, in many particulars, anything of the kind we see to day.

Immediately before the races, Col. John Funk's celebrated trotter Convoy was brought on the track to give an exhibition of his speed. Convoy is only five years old, and has already trotted his mile in remarkably fast time, and dusted a number of the coming cracks of the country. Convoy is by Woodford Mambrino, himself a famous trotter, and is likely to keep the family reputation up. He is a shapely grey, with a long barrel, fine legs, and "wind to sell."

The running race, a mile dash, was called, and three flyers came to the string—Joe Rhodes, Matagorda, and Woodford. All of them had come together Wednesday, and although Matagorda won it, the friends of neither of the other two horses would admit the little mare's superiority. The friends of Rhodes asserted that a half mile was too short a run for him; that in that distance he hardly had time to shake himself out. The friends of Woodford claimed that his fretfulness on Wednesday injured his chances, and that his being in better humor now, argued that he could be relied on to do his best, and that they were sure would surprise somebody. The friends of the mare, however, insisted that she had not only beaten her competitors once, but could do it again. The three looked remarkably well, and got off at the first start. Away they flew, and amid the yells of the excited multitude, Matagodo came in apparently an easy winner in 1:50. The enthusiasm at the game little beast's achievement was unbounded.

Saturday the weather was beautiful, and the largest crowd of the week were to be seen seated upon the amphitheatre, and strolling about the grounds. This being the last day, exhibitors were busily engaged removing their goods from floral hall, stock men collecting their premiums, and puttings things in readiness for the homeward march. Altogether, it was a very pleasant week, and our fair directory are to be congratulated upon the success of the show, and the fact that, after paying expenses, a handsome little balance will be left in the treasury.

The Secretary of this Association is J. E. Rankin, Esq., Post-office Henderson, Kentucky.

NORTH KENTUCKY AGRICULTURAL SOCIETY

This Association held its twenty-first annual fair on their grounds near Florence, Boone county, Kentucky, on August 27th, 1878, and continued the same for five days.

There was an excellent display of all kinds of manufactured articles, and farm, orchard, and garden productions. The live stock of all kinds on exhibition were equal to any shown in the State. The crowd of visitors was large, the premiums adjudged to the satisfaction of everybody, and good cheer, bountiful dinners, and perfect order, and general satisfaction and happiness were everywhere visible.

The following are the *general regulations* of this Society:

1. The exhibition will commence each day at 9½ o'clock, by which time all entries shall be made with the Secretary.

2. Any person whatever may compete for premiums in any or all rings, free of charge.

3. No person shall be allowed to enter or exhibit stock of which he is not the owner; or any article, unless he be the manufacturer or inventor; and all articles in the hands of agents or commission merchants shall be entered and exhibited in the name of the manufacturer or inventor.

4. All articles exhibited in the fruits, pantry and dairy, vegetables, and agricultural productions, must be the product or labor of, or grown by, the exhibitor.

5. Any person who willfully makes known his ownership of stock on exhibition to the judges, shall not be entitled to a premium on such stock.

6. All stock exhibited for herd premiums must be the *bona fide* property of the person or firm exhibiting them, and not made up for the purpose of exhibition from different owners.

7. Animals may compete in all the rings of their sex and age until they have taken a premium, after which they will be excluded from all rings, excepting sweepstakes and herds.

8. No animal or article excluded on account of having taken a premium at a former fair of this Society.

9. No animal four years old and upwards shall be permitted to compete for a premium in breeding rings, unless it has proven itself a breeder.

10. Whenever the judges are not satisfied with the age of an animal, the owner or exhibitor will be required to bring proof thereof.

11. All harness animals, three years and over, must be shown in harness; and no stock on exhibition in the ring permitted to run at large except milch cows and fatted cattle.

12. All premiums will be paid in money.

13. All persons, including stockholders, desiring stalls for stock to be exhibited, will be required to pay fifty cents per day for each stall. Stable, $1 50 per day. For sheep or hog pens, fifty cents. Feed will be furnished by the Society at the market price, and bedding for stock free of charge.

14. Persons renting booths must, in all cases and under all circumstances, refrain from keeping, selling, or giving away spirituous or malt liquors, cordial, bitters, wine or cider.

15. The Board will reserve the right to examine at any time, either personally, by police or committee, all saloons, booths or shows, for the purpose of ascertaining if the provisions of the 14th regulation are observed.

16. That clause in the charter subjecting persons who come into the Fair Grounds clandestinely to a fine of not less than $10 or more than $25, will be rigidly executed.

17. No person other than the officers of the Society and judges shall be allowed to go into the ring when the stock and different articles are placed on exhibition.

18. Products of convict's labor excluded in all cases.

19. Ten minutes from the striking of the bell or call the gates will be closed.

20. Drivers of public conveyances will be required to pay for all passengers at the time of passing the gates.

21. All premiums and other claims against the Society, not paid during the continuance of the fair, will thereafter be paid by the Treasurer, at Florence, until the first of January following. All claims not called for by the first of January following shall be forfeited to the Society.

22. Hallooing and using any menacing or disrespectful language towards the judges in the ring will not be allowed, under the penalty of the person so offending being arrested and ejected from the grounds.

23. Gaming and betting of every description positively prohibited on the Fair Grounds.

24. No foul driving will be permitted in the ring inside the amphitheatre.

25. Any person objecting to a judge must file his objection in writing, over his own signature, with the Secretary, in order that the Board may pass upon it.

26. For the better systematizing of business, and to distribute the work of the fair more equally, each class or department shall be in charge of two or more Directors, under the title of "Directors in charge."

27. It shall be their duty to fill all vacancies among the judges, in their various departments, to notify them of their appointments, and to give them, if necessary, such aid and instruction as they may require.

28. Upon the acceptance of the judges of their appointment, the Directors in charge shall cause the marshals to publicly announce their names in the ring. Any one finding objections to the same, will proceed according to Rule 25, General Regulations.

29. The Directors in charge and the marshals shall, at all times, rigidly enforce Rule 17, General Regulations, and especially on the first day, until every article has been judged upon, and the Secretary has obtained the names of the successful parties.

30. The Secretary will be furnished with a list of the judges for future reference.

31. Blue ribbon shall designate the first, and red the second premium.

32. In no case shall the judges award premiums or diplomas, unless the articles or stock are deemed meritorious or fill the requirements of the class to which they belong.

33. If any person, in violation of the foregoing rules of this Association, shall receive a premium, it shall be the duty of the Treasurer, as soon as the fact is ascertained, to institute suit for the recovery of the same.

RULES AND RATES OF ADMISSION.

Stockholders and their families, consisting of their wives and children, excepting males over twenty-one years, admitted free.

Persons 15 years and over,	25 cents.
Children 10 to 15 years,	15 "
One horse buggy or spring wagon,	25 "
Two-horse carriage or spring wagon,	30 "
Four-horse omnibus, per trip,	50 "
Two-horse omnibus, per trip,	40 "
Horses, per head,	10 "
Stock for exhibition,	Free.

The following are the officers of the Association:

President—George M. Bedinger.

Vice President—William Cochran.

Treasurer—Fielding Dickey.

Secretary—E. A. Tucker, Florence Post-office, Kentucky.

Directors—John Barton, W. A. Carpenter, Woodford Carpenter, Absalom Conner, Henry Riggs, Daniel S. Root, George W. Terrell.

NELSON COUNTY AGRICULTURAL SOCIETY.

The thirteenth annual exhibition of this Association took place on September 3d, 4th, and 5th, 1878, at their Fair Grounds, near Bardstown, Kentucky. The attendance was large, and the success of the meeting fully up to the expectation of the stockholders. There are every convenience usual for fairs at the grounds of this Society, a large, well appointed amphitheatre, stock stalls, good water, and perfect order.

The floral hall erected last year proved quite a success, and added greatly to the interest of the fair. This hall is adjacent to the amphitheater, and was filled with fancy goods, and field, garden, and orchard products.

The following are the regulations of this Society:

1. Premiums open to the world.

2. All premiums will be paid in money.

3. No premium will be awarded to any animal or article unless the judges shall deem it worthy of a premium.

4. The names of the judges of each class will be announced upon the calling of the particular ring of which they are the judges.

5. An animal taking a premium in its class, and sweepstakes in any class, will not be permitted to enter another ring, unless to make a pair, or in the general sweepstakes, or to compete for a special premium.

6. Stock owners will pay the usual gate fees, and nothing will be charged for entry of any article or animal in the ring; but 25 per cent. will be deducted and reserved from the amount of the premium paid to the winner, except where the premium does not exceed $1, in which case no entry fee will be charged, and nothing deducted from the amount of the premium, except on trotting track, when 20 per cent. will be charged.

7. No person shall make known to the judges his ownership of stock or articles to be exhibited, under penalty of being excluded from competition if known before, and forfeiting the premium if known after, the award is made.

8. No member of the Board, or other officer of the Association, will be permitted to exhibit his stock in person inside the amphitheater.

9. Exhibitors must make their entries ten minutes before the calling of the ring in which they desire to exhibit.

10. All stock and articles must be entered by, and in the name of, the owners in their proper class. Articles, which are the result of mechanical or artistic skill, must be entered by the artist, manufacturer, contriver, owner, or his or their agent.

11. Articles, which are the product of the soil, must be entered in the name of the producer of the same; and no person shall exhibit fruit or other products of the soil other than his own raising.

12. The President, Vice President, or one of the Directors, shall attend to each Awarding Committee in viewing the different classes of stock or articles; and no person, other than the judges and officers of the fair and grooms, will be allowed to be present in the ring.

13. A plurality of the judges shall decide to whom a premium shall be awarded.

14. The combing or carding of long-wooled sheep will not be allowed.

15. The marshals are clothed with the authority of peace officers by the late act of the General Assembly.

16. The sale of intoxicating liquors on or near the Fair Grounds is positively prohibited. No gambling, drunkenness, or profane swearing, or any immoral practice, will be allowed on or near the grounds. An efficient police force will be constantly on the grounds, and the public are assured that good order will be preserved.

17. By a late act of the General Assembly the Association has exclusive control of one half mile in every direction from the Fair Grounds, and will enforce their regulations outside as well as inside the grounds. Persons desiring to exhibit machinery, implements, or articles for which no premiums are offered, or not entered for competition, will be furnished proper space therefor, on making application to the President or Secretary.

Election for President, three Vice Presidents, and fifteen Directors, is held on the second Monday of April of each year.

The following are the officers of the Association:

President—Lud. McKay.

Vice Presidents—A. C. Wilson, Squire Murphy, and J. D. Wickliffe.

Directors—J. L. Spalding, A. M. Cartmell, Henry Sutherland, Thos. S. Grundy, S. P. Lancaster, James Coy, William Beam, George M. D. Stoner, Pitts Stallard, Thos. H. Briggs, Samuel R. Grundy, J. P. Hinkle, W. N. Beckham, Alex. Sayers, and T. W. Samuels.

Secretary and Treasurer—A. R. Carothers.

Ring Marshal—A. C. Thomas.

Assistant Ring Marshal—Andrew Briggs.

KENTUCKY INDUSTRIAL ASSOCIATION.

The fifth annual fair of this Association was held at their Fair Grounds, near Frankfort, on September 4th, 5th, and 6th, 1878. The entries of live stock of every kind were fully equal to that of any previous year. The display of needle-work, farm, garden, and orchard productions was excellent. The race-track of the Association was a central point of attraction, and the thorough-bred racers, there contending for premiums, attracted a very large and eager crowd, that seemed to enjoy the contests with as much zest as they could have exhibited upon a regular race-course. The time made by the racers was very good, and the satisfaction expressed by the large assemblage of people showed clearly that the judges and other officers performed their duties well

The dinners provided by the President of the Association, and by the energetic, graceful, accomplished, and hospitable ladies of Franklin county, could not be excelled, either in their *material* or *cuisine.*

The horses and cattle on exhibition were all, or nearly all, thorough-breds, and represented some of the best studs and herds in the State. Fine thorough-bred racers and trotters contended, in generous rivalry, for premiums, and the decisions of the judges were nearly always in accordance with the judgment of many of the most noted stock men in the State, who were present on the ground.

Among the attendants were the Governor of the State, and all the State officers, and the Judges of the Court of Appeals, besides many noted stock-raisers from different counties in Kentucky, as well as from neighboring States. The young people enjoyed the fair week with great zest, and ended their pleasures by having a grand hop or dance at the ball-room of the Capital Hotel, the net proceeds of which were generously donated by the hotel proprietor, Maj. R. C. Steele, to the yellow fever sufferers at Memphis and other places.

The following are the officers of the Association:

President—Gen. Scott Brown.

Vice President—H. C. McDowell.

Secretary—E. M. Drane.

Treasurer—James W. Tate.

Board of Directors—Stephen Black, D. L. Haly, R. P. Pepper, D. M. Bowen, W. L. Jett, O. S. Walcutt, Geo. T. Graddy, Dr. A. Hurst, Warren Viley, J. M. Saffell, L. Hord, R. C. Steele, R. C. Church, L. E. Harvie, J. N. Crutcher, Thos. Mahoney, W. J. Lewis, Geo. W. Robb, A. W. Macklin.

Honorary and Advisory Directors—Hiram Berry, Jas. Blackburn, Jos. Robinson, J. W. H. Reynolds, J. Stoddard Johnston, Orlando Brown.

THE COLORED AGRICULTURAL AND MECHANICAL ASSOCIATION OF FAYETTE COUNTY.

This is the largest and best appointed Colored Agricultural and Mechanical Association in the State. They held their tenth annual fair at their Fair Grounds, near Lexington, Kentucky, on the 24th, 25th, 26th, and 27th of August, 1878. The premiums amounted to over $1,500; and the articles on exhibition were numerous, well arranged, and of excellent quality. Much of the live stock was very fine. The meeting was orderly, well patronized, and in every way a success. Mr. A. L. Hardin, Secretary, sent me the following report of the proceedings and awards of premiums:

FIRST DAY'S AWARD.

Articles exhibited.	To whom awarded.
White flannel	Mrs. Charlotte Frazer, Bourbon.
Yarn socks	Mrs. Keziah Braxton, Fayette.
Cotton socks	Miss Fannie Richardson, Fayette.
Silk quilt	Miss Mary Warfield, Fayette.
Woolen quilt	Mrs. Jane Chatman, Fayette.
Cotton quilt	Miss Sallie Dotson, Fayette.
Shirt, hand-made	Miss Tenie Jones, Bourbon.
Crochet work	Mrs. Annie Hammons, Fayette.
Silk embroidery	Mrs. Mary Chatman, Fayette.
Worsted embroidery	Miss Queen Ballard, Fayette.
Butter	Mrs. Rosa Ramey, Fayette.
Pound cake	Mrs. Lucy Smoot, Bourbon.
Sponge cake	Miss Sallie Bush, Fayette.
Ginger cake	Mrs. H. Jackson, Fayette.
Silver cake	Mrs. Sidney Dunn, Fayette.
Marble cake	Mrs. Charley Lewis, Fayette.
Black cake	Miss Emma Jackson, Fayette.
Light bread, yeast made	Mrs. Lucy Smoot, Bourbon.
Light bread, salt rising	Miss Eliza Talbott, Fayette.
Preserves, peaches	Miss Eliza Talbott, Fayette.
Quince jelly	Miss Ella Taylor, Fayette.
Preserves, plums	Miss Ella Taylor, Fayette.
Preserves, strawberry	Miss Mary Warfield, Fayette.
Blackberry jam	Miss Maria Williams, Fayette.
Grape jelly	Miss Ella Taylor, Fayette.
Currant jelly	Miss Maria Williams, Fayette.
Crab-apple jelly	Mrs. H. Butler, Fayette.
Grape wine	Mrs. E. B. Jackson, Fayette.
Currant wine	Mrs. E. B. Jackson, Fayette.
Blackberry wine	Mrs. Julia Johnson, Fayette.
Blackberry cordial	Robert Hughes, Fayette.
Peach cordial	Mrs. Jane Richardson, Fayette.
Natural cut flowers	Mrs Tillman Tibbs, Fayette.
Irish potatoes	J. H. Dodd, Fayette.
Sweet potatoes	Albert Coleman, Fayette.
Beets	J. H. Dodd, Fayette.
Cabbage	Mrs. Charlotte Frazer, Fayette.
Watermelon	J. H. Dodd, Fayette.
Muskmellon	Chas. Fisher, Fayette.
Houdan chickens	J. H. Dodd, Fayette.
Brahma chickens	J. H. Dodd, Fayette.

Ducks	J. H. Dodd, Fayette.
Turkeys	J. H. Dodd, Fayette.

BEST DRILLED COMMANDERY OF KNIGHTS TEMPLAR.

First prize—Cincinnati Commandery.

Second—Lexington.

Buggy horse or mare, 3 years old and upward	Aubry & Nichols, Fayette.
Saddle horse or mare, 3 years old and upward	Aubry & Nichols, Fayette.

SECOND DAY'S AWARD.

Horse mule, under 1 year old	Chas. Covington, Fayette.
Mare mule, 1 year old and under 2	A. Pearsol, Fayette.
Mare mule, 3 years old and upward	Anderson Ellis, Fayette.
Jack, 1 year old and under 2	Robert Meur, Boyle.
Jack, 2 years old and under 3	P. Atkins, Fayette.
Jack, 3 years old and upward	Robt. Meur, Boyle.
Jennet, under 1 year old	William Davis, Fayette.
Jennet, 1 year old and under 2	Wesley Carter, Fayette.
Jennet, 2 years old and under 3	Wesley Carter, Fayette.
Jennet, 3 years old and upward	William Davis, Fayette.
Jack, any age	Robert Meur, Boyle.
Harness stallion, 2 years old and under 3	Jasper Rogers, Fayette.
Harness gelding, 2 years old and under 3	James Thomas, Scott.
Harness mare, 2 years old and under 3	Thos. Jefferson, Harrison.
Heifer calf, under 1 year old	B. R. Shaw, Fayette.
Cow, 1 year old and under 2	Ben. Fry, Fayette.
Cow, 2 years old and under 3	Ben. Fry, Fayette.
Cow, 3 years old and upward	Anthony Eligan, Fayette.
Bull calf, under 1 year old	Ben. Fry, Fayette.
Bull, 1 year and under 2	Ben. Fry, Fayette.
Bull, any age	Ad. Russell, Fayette.
Cow, any age	Anthony Eligan, Fayette.
Yoke oxen	Abe Mathews, Fayette.
Buck, 1 year old and under 2	E. Milton, Bourbon.
Ewe, 1 year old and under 2	E Milton, Bourbon.
Ewe, 2 years old and upward	E. Milton, Bourbon.
Buck, any age	E. Milton, Bourbon.
Ewe, any age	E. Milton, Bourbon.
Boar under 1 year old	Owen Morton, Fayette.
Boar, 1 year old and under two	L. R. Huffman, Fayette.
Boar, 2 years old and upward	L. R. Huffman, Fayette.
Sow, under 1 year old	L. R. Huffman, Fayette.
Sow, 1 year old and under 2	Henry Lee, Fayette.
Sow, 2 years old and upward	L. R. Huffman, Fayette.
Boar, any age	L. R. Huffman, Fayette.
Sow, any age	L. R. Huffman, Fayette.
Saddle mare, 2 years old and under 3	Charles Faulkner, Woodford.
Saddle mare, 3 years old and under 4	Ed. Christopher, Fayette.
Saddle mare, 4 years old and upward	Burl Willis, Harrison.

Saddle stallion, 1 year old and under 2	Charles Faulkner, Woodford.
Saddle stallion, 2 years old and under 3	J. B. Payne, Fayette.
Saddle stallion, 4 years old and upward	Charles Faulkner, Woodford.
Harness stallion, 1 year old and under 2	Asa Wright, Fayette.
Harness stallion, 2 years old and under 3	Asa Wright, Fayette.
Harness stallion, 3 years old and under 4	W. W. Craig, Woodford.
Harness stallion, 4 years old and upward	James Coleman, Fayette.
Best shot, with shot-gun, at glass balls	Thos. McGee, Fayette.

THIRD DAY'S AWARD.

Dressed hemp	Jacob Bibbs, Fayette.
Brooms	Levi Burns, Jessamine.
Single harness	Thompson & Boyd, Fayette.
Gentleman's saddle	Thompson & Boyd, Fayette.
Saddle colt, under 1 year old	Hence Miller, Fayette.
Harness colt, under 1 year old	Dudley Simpson, Fayette.
Harness colt, 1 year old and under 2	J. H. Blackford, Fayette.
Harness mare colt, 1 year old and under 2	James Coleman, Fayette.
Harness horse or mare colt, 1 year old and under 2	Henry Chivis, Fayette.
Saddle colt, regardless of sex, 1 year old	Elijah Taylor, Clark.
Phaeton pony	Dr. Coleman, Fayette.
Model horse or mare	Solomon Pints, Fayette.
Rockaway horse or mare	Solomon Pints Fayette.
Harness gelding, 2 years old and under 3	Andrew Scott, Fayette.
Harness gelding, 3 years old and under 4	M. G. Featherston, Fayette.
Harness gelding, 4 years old and upward	Aubry & Nichols, Fayette.
Harness mare, 2 years old and under 3	Thos King, Fayette.
Harness mare, 4 years old and upward	J. W. Spencer, Fayette.

FOURTH DAY'S AWARD.

Brood mare, any age	Robert Mathews, Fayette.
Saddle gelding, 2 years old and under 3	Sidney Dixon, Fayette.
Saddle gelding, 3 years old and under 4	M. G. Featherston, Fayette.
Saddle gelding, 4 years old and upward	Aubry & Nichols, Fayette.
Combined gelding or mare	Aubry & Nichols, Fayette.
Harness gelding, mare, or stallion	James Coleman, Fayette.
Gentleman rider	Thad. Brown, Fayette.
Lady rider	Miss R. Jackson, Fayette.
Finest turnout, lady and gentleman in buggy	Miss M. E. Britton and A. Scott, Fayette.
Finest looking baby, either sex	Mrs. Tecia Smith, Fayette.
Gentleman driver, single horse	John Duncan, Clark.
Walking horse or mare	Wm. Boyce, Fayette.
Racking horse or mare	Jacob Mathews, Fayette.
Harness stallion, 5 years old and upward	James Coleman, Fayette.
Harness gelding, 5 years old and upward	James Doyle, Fayette.
Harness mare, 5 years old and upward	J. H. Blackford, Fayette.

The officers of this Association are:

President—H. P. Gaines.

Vice President—Isaac Lee.

Treasurer—Wm. L. Taylor.

Secretary—A. L. Hardin.

Ring Master—E. W. Jackson.

Field Marshal—Robert Robinson.

Directors—Alex. Williams, John Warfield, Henry King, Wm. Stuban, Henry Lee, A. W. Redd, and Thomas Wilson.

UNREPORTED SOCIETIES AND FAIRS.

I have received (though I have repeatedly asked) no report of the fairs held during the year 1878 from the following Associations. It is to be hoped that hereafter all the Associations, holding fairs or exhibitions in the State, will give to this Bureau accurate reports of their proceedings.

Name of Association.	Name of Secretary.	Name of President.	Location.
Bath Co. Ag and Mechan. Ass'n. .	. . . .	. . . .	Sharpsburg.
Bourbon Co. Agricultural Society .	L. P. Muir. . .	. . . .	Paris.
Boyd Co. Ag and Mechanical Ass'n	. . . .	. . . .	Ashland.
Breckinridge Ag. and Mechan. Ass'n	. . . . .	. . . .	Hardinsburg.
Eminence Ag. and Mechanical Ass'n	N. W. Gould. .	W S. Pryor . .	Eminence.
Green River Ag. and Mechan. Ass'n	Geo. Cake . . .	J. F. G. Winlock	Glasgow
Harrison Co. Ag and Mechan. Ass'n	R. M. Collier. .	. . . .	Cynthiana.
Louisville Exposition Company . .	E. A. Maginness,	. . . .	Louisville.
Meade Co. Ag. and Mechan. Ass'n .	. . . . .	. . . .	Brandenburg.
Mercer Co. Ag. and Mechan. Ass'n,	J. H. Lapsley .	. . . .	McAfee.
Muhlenburg Co. A. and M Ass'n . .	. . . .	. . . . .	Greenville.
Nelson Co. Ag and Mechan. Ass'n,	A. R. Carothers,	Lud. McKay . .	Bardstown.
Pendleton Co. A. and M. Ass'n . .	J. W. Chowning	. . . .	Falmouth.
Pulaski Co. Ag. and Mechan. Ass'n,	F. M. Cox . . .	. . . .	Somerset.
Union A. & M. A'n of Mason & Brck'n	J. M Nolin . .	Evan Lloyd . .	Germantown.
Warren Co. Ag. and Mechan. Ass'n,	Sam'l Kirtley. .	. . . .	Bowling Green
Colored Fair Ass'n of Shelby County	. . . .	. . . .	Shelbyville.
Colored Fair Ass'n of Bourbon Co. .	. . . .	. . . .	Paris.
Colored Fair Ass'n of Clark County,	. . . .	. . . .	Winchester.

There may be other Associations in the State which are not mentioned here; and some errors may be found in the above list, which will be corrected when proper reports are made to the Bureau at Frankfort.

Granges.—The Kentucky State Grange, numerous county Granges, and several hundred subordinate Granges, are in operation in the State. The proceedings of these institutions, though relating entirely to husbandry, are not reported for publication. A great many very flourishing Granges hold regular monthly meetings in different counties in the State, and report quarterly to the State Grange.

STATISTICAL TABLES.

These tables, which immediately follow, are taken from the Auditor's Report for 1878. This Report is based upon the returns made yearly by the State and county assessors in each county of the Commonwealth, and are in the main correct. All property is assessed from the 10th day of January each year, so that the estimates of the assessors, and also of the Auditor's tables, date upon that day. The crops, &c., which appear under the list of 1878 were necessarily the growth of the summer of 1877; or, in other words, of the year previous to their dates in the tables. This is the usual system of collating all tabular estimates; for instance, the census reports of 1870 are for crops, &c., grown in 1869, and those of the census of 1880 will represent the growth of 1879. Table No. 1 shows the estimated expenditures for the fiscal year ending October 10, 1879. Table No. 2 shows the estimated receipts for taxes, &c., for the fiscal year ending October 10. 1879. Table No. 3 shows the average value of lands in each county, according to the assessors' returns, dating from January 10, 1878. Table No. 4 shows the entire taxable property of the Commonwealth, and various other items of general interest to the people of the State. This table separates the statistics of the whites from those of the negroes, chiefly for the reason that all the taxes collected from the negroes go into the free colored school funds, which are used exclusively in educating the negro children in the State. In order, therefore, to arrive at the sum of crops, &c., stated in Table 4, it is necessary to add together, for any county desired, that portion under the regular heads and the items of the corresponding county under the head "Negro," in the last part of the table.

No. 1.

A STATEMENT *showing the estimated expenditures of the State for the year ending* 10*th October*, 1879:

Asylum, Blind	$21,000 00
Asylum, Deaf and Dumb	20,000 00
Asylum, Eastern Lunatic	108,000 00
Asylum, Western Lunatic	75,000 00
Asylum, Central Lunatic	80,000 00
Feeble-minded Institute	26,000 00
American Printing-house for the Blind	10,000 00
Attorneys	10,000 00
Criminal prosecutions	131,000 00
Contingent expenses	20,000 00
Commissioners of tax	73,000 00
Clerks' services	54,000 00
Clerks paid trustees	160,000 00
Conveyance of lunatics	5,000 00
Conveyance of convicts	19,000 00
Distribution of public books	500 00
Decisions Court of Appeals	5,000 00
Expresses	1,000 00
Frankfort Cemetery	100 00
Scalps	12,000 00
Jailers	125,000 00
Index to general laws	100 00
Idiots	50,000 00
Louisville Court-house Commissioners	800 00
State Arsenal	1,500 00
Paper for Public Printing	6,000 00
Public Printing and Binding	50,000 00
Public Library	500 00
Rewards	6,000 00
Revenue Supervisors	3,000 00
Salaries	160,000 00
Stationery for public use	3,000 00
Sheriffs' paid trustees	60,000 00
State Library Fund	100 00
Trustees Jury Fund	24,000 00
Geological Survey	28,000 00
Prison Inspectors and Physicians	800 00
State Board of Health	2,000 00
War claims	1,500 00
Amount carried forward	$1,352,900 00

No. 1—Continued.

Amount brought forward	$1,352,900 00
Cost of suits	9,000 00
Fish culture	2,000 00
South Fork Kentucky River	, 790 00
Breckinridge monument	10,000 00
Total	$1,374,690

No. 2.

A Statement *of moneys which may be expected to be paid into the Treasury during the year ending on the* 10*th October,* 1879, *subject to the expenses of the State, viz:*

Amount of revenue, 1878, chargeable to sheriffs		$1,416,078 70
Deduct sheriffs' commissions, &c.	$165,000 00	
Deduct amount paid previous to 10th October, 1878	49,382 88	
		214,382 88
		$1,201,695 82
Of this belongs to—		
Sinking Fund	$150,211 98	
School Fund	600,847 91	
		751,059 89
Leaving for revenue		$450,635 93
From Clerks	$160,000 00	
From corporations	275,000 00	
From Trustees Jury Fund	25,000 00	
From turnpike roads	30,000 00	
From Sheriffs, &c.	65,000 00	
From Sinking Fund	80,000 00	
		635,000 00
Total estimated receipts for 1879		$1,085 635 93
Add balance in Treasury 10th October, 1878		247,568 80
Making		$1,333,204 73
Deduct estimated expenses for 1879		1,374,690 00
Estimated deficit 10th October, 1879		$41,485 27

No. 3.

A STATEMENT *showing the average value per acre of land in the different counties for the years 1877 and 1878; also the increase and decrease value per acre as reported to this office, to-wit:*

COUNTIES.	Average value per acre, 1877.	Average value per acre, 1878.	Increase.	Decrease.
Adair	$5 24	$4 97		$0 37
Allen	5 75	5 66		09
Anderson	9 84	8 65		1 19
Ballard	6 91	7 90	$0 99	
Barren	7 97	7 32		65
Bath	10 77	9 75		1 02
Bell	1 39	1 28		11
Boone	27 77	26 23		1 54
Bourbon	44 28	38 70		5 58
Boyd	13 56	13 89	33	
Boyle	23 48	22 62		86
Bracken	17 50	15 32		2 18
Breathitt	83	92	09	
Breckinridge	6 38	6 07		31
Bullitt	9 88	8 04		1 84
Butler	3 89	3 92	03	
Caldwell	6 17	5 63	46	
Calloway	5 16	5 17	01	
Campbell	38 69	35 91		2 78
Carroll	19 39	17 63		1 76
Carter	4 46	3 62		84
Casey	4 36	4 07		29
Christian	8 38	8 35		03
Clark	25 01	22 33		2 68
Clay	1 45	1 83	38	
Clinton	5 89	5 72		17
Crittenden	6 15	5 54		61
Cumberland	6 75	6 76	01	
Daviess	14 34	11 89		2 45
Edmonson	3 71	3 62		09
Estill	5 06	4 90		16
Elliott	3 11	3 91	80	
Fayette	44 57	39 24		5 33
Fleming	12 00	11 51		49
Floyd	1 88	1 81		07
Franklin	18 67	19 59	92	
Fulton	9 59	9 03		56
Gallatin	18 96	16 93		2 03
Garrard	17 64	16 95		69
Grant	14 58	13 90		68
Graves	7 97	6 99		98
Grayson	3 75	3 57		18
Green	4 98	4 72		26
Greenup	7 12	6 75		37
Hancock	8 94	8 93		01
Hardin	5 87	5 79		08
Harlan	1 45	72		73
Harrison	19 46	18 56		90
Hart	6 66	11 50	4 84	
Henderson	10 46	9 56		90
Henry	17 92	16 46		1 46

No. 3.—Continued.

COUNTIES.	Average value per acre, 1877.	Average value per acre, 1878.	Increase.	Decrease.
Hickman	$7 96	$7 47		$0 49
Hopkins	4 58	4 06		52
Jackson	2 12	2 00		12
Jefferson	42 06	39 46		2 60
Jessamine	22 94	25 09	$2 15	
Johnson	3 50	3 62	12	
Kenton	35 56	34 15		1 41
Knox	3 25	3 21		04
Larue	7 57	7 69	12	
Laurel	2 88	2 32		56
Lawrence	2 84	3 22	38	
Lee	2 73	2 76	03	
Letcher	97	65		32
Lewis	5 07	5 25	18	
Lincoln	14 85	14 24		61
Livingston	5 82	5 59		23
Logan	8 08	7 56		52
Lyon	5 05	4 72		33
Madison	18 50	18 63	13	
Magoffin	2 19	2 23	04	
Marion	9 65	9 60		05
Marshall	5 12	4 71		41
Martin	1 52	1 46		06
Mason	31 92	31 61		31
McCracken	9 30	7 94		1 36
McLean	7 52	6 93		59
Meade	8 32	8 52	20	
Menifee	1 14	1 01		13
Mercer	17 40	16 15		1 25
Metcalfe	5 65	4 93		72
Monroe	4 94	4 76		18
Montgomery	20 32	18 30		2 02
Morgan	1 99	2 01	02	
Muhlenburg	5 11	4 84		27
Nelson	11 45	10 76		69
Nicholas	18 47	15 86		2 61
Ohio	5 87	5 67		20
Oldham	18 23	16 16		2 07
Owen	9 82	8 76		1 06
Owsley	3 08	3 02		06
Pendleton	13 34	12 24		1 14
Perry	53	44		09
Pike	1 78	1 66		12
Powell	3 79	3 69		10
Pulaski	3 85	3 62		23
Robertson	10 54	8 96		1 58
Rockcastle	3 50	3 26		24
Rowan	1 95	1 71		24
Russell	4 81	4 89	08	
Scott	25 83	24 95		88
Shelby	23 65	22 69		96
Simpson	9 27	8 82		45
Spencer	13 10	11 97		1 13
Taylor	5 20	4 74		46
Todd	8 31	7 15		1 16
Trigg	5 72	5 94	22	
Trimble	13 82	13 20		62

No. 3—Continued.

COUNTIES.	Average value per acre, 1877.	Average value per acre, 1878.	Increase.	Decrease.
Union	$8 69	$9 31	$0 62	
Warren	11 75	11 17		$0 58
Washington	9 85	9 60		25
Wayne	4 28	3 74		54
Webster	6 03	5 48		55
Whitley	1 86	1 76		10
Wolfe	3 09	2 29		80
Woodford	35 06	31 65		3 41

No. 4.

THIS STATEMENT *exhibits the entire taxable property in the Commonwealth of Kentucky for the years the increase and decrease of each and every item. There is also exhibited at the end of this Table also the number of negro children between 6 and 21 years old, and number of male negroes over 21 years*

COUNTIES.	Acres of land, 1877.	Acres of land, 1878.	Increase.	Decrease.	Value of land, 1877.
Adair	219,264	221,020	1,756		$1,149,033
Allen	193,522	187,373		6,149	1,113,133
Anderson	114,190	123,308	9,118		1,123,895
Ballard	240,070	208,285		31,785	1,658,573
Barren	264,109	260,971		3,138	2,103,717
Bath	164,217	159,859		4,358	1,769,040
Bell	252,303	227,742		24,561	353,915
Boone	151,044	150,663		381	4,195,163
Bourbon	173,318	178,611	5,293		7,675,517
Boyd	99,257	93,657		5,600	1,346,424
Boyle	105,682	104,001		1,681	2,481,312
Bracken	120,556	120,157		399	2,110,051
Breathitt	614,285	527,265		87,020	510,323
Breckinridge	322,577	324,415	1,838		2,059,599
Bullitt	159,339	168,309	8,970		1,575,703
Butler	243,914	215,803		28,111	950,646
Caldwell	182,447	183,102	655		1,126,507
Calloway	242,026	242,971	945		1,359,145
Campbell	86,852	90,667	3,815		3,360,622
Carroll	77,076	75,047		2,029	1,494,835
Carter	251,791	304,432	52,641		1,124,896
Casey	217,310	219,828	2,518		949,094
Christian	361,811	373,127	11,316		3,033,540
Clark	153,116	156,857	3,741		3,829,253
Clay	541,126	349,918		191,208	785,317
Clinton	103,829	104,141	312		612,260
Crittenden	196,294	200,671	4,377		1,207,317
Cumberland	130,575	125,309		5,266	881,142
Daviess	264,608	283,956	19,348		3,796,505
Edmonson	180,810	165,477		15,333	670,871
Estill	166,775	154,679		12,096	845,411
Elliott	133,090	132,880		210	414,852
Fayette	172,523	171,576		947	7,609,692
Fleming	207,310	207,407	97		2,488,640
Floyd	378,346	386,615	8,269		713,415
Franklin	122,568	114,990		7,578	2,288,957
Fulton	107,930	98,314		9,616	1,035,385
Gallatin	60,754	59,030		1,724	1,152,332
Garrard	133,976	129,593		4,383	2,364,090
Grant	150,909	142,563		8,346	2,200,667
Graves	313,664	300,044		13,620	2,499,378
Grayson	285,656	282,750		2,906	1,071,080
Green	152,940	151,916		1,024	763,019
Grenup	209,396	207,318		2,078	1,491,008
Hancock	108,350	92,819		15,531	968,930
Hardin	293,836	321,518	27,682		1,725,446
Harlan	281,225	576,194	294,969		410,465
Harrison	185,682	183,648		2,034	3,615,140
Hart	231,410	125,866		105,544	1,541,731
Henderson	254,328	245,676		8,652	2,660,294
Henry	161,531	171,002	9,471		2,965,263
Hickman	137,923	143,792	5,869		1,098,677
Hopkins	297,099	301,562	4,463		1,360,611
Jackson	156,752	163,870	7,118		332,570
Jefferson	222,398	213,652		8,746	9,355,645
Jessamine	114,001	102,429		11,572	2,615,240
Johnson	168,034	162,740		5,294	588,618
Kenton	95,913	96,651	738		3,411,330

No. 4—Continued.

1877 and 1878, stating each county separately; also, showing the grand total, with valuation, the tax, the total taxable property of the negroes in the Commonwealth of Kentucky in the years 1877 and 1878; old, for the years 1877 and 1878, and increase and decrease in each:

Value of land, 1878.	Increase.	Decrease.	No. of town lots, 1877.	No. of town lots, 1878.	Increase.	Decrease.
$1,099,067	----------	$49,966	103	123	20	----------
1,060,587	----------	52,546	162	154	----------	8
1,067,674	----------	56,821	147	144	----------	3
1,646,734	----------	11,839	381	376	----------	5
1,910,992	----------	192,725	348	345	----------	3
1,559,212	----------	209,828	252	226	----------	26
292,910	----------	61,005	26	25	----------	1
3,952,664	----------	243,099	583	596	13	----------
6,892,377	----------	783,140	674	697	23	----------
1,301,021	----------	45,403	1,769	1,728	----------	41
2,352,628	----------	128,684	476	491	15	----------
1,840,726	----------	269,325	493	507	14	----------
486,571	----------	23,752	28	30	2	----------
1,970,810	----------	88,789	521	541	20	----------
1,453,198	----------	122,505	224	219	----------	5
847,755	----------	102,891	192	180	----------	12
1,031,000	----------	95,507	255	236	----------	19
1,256,715	----------	102,430	193	183	----------	10
3,255,931	----------	104,691	6,886	6,946	60	----------
1,323,455	----------	171,380	562	605	43	----------
1,102,759	----------	22,137	225	212	----------	13
895,394	----------	53,700	51	52	1	----------
3,117,294	$83,754	----------	673	639	----------	34
3,502,760	----------	326,493	252	259	7	----------
642,276	----------	143,041	14	23	9	----------
595,825	----------	16,435	118	173	55	----------
1,112,979	----------	94,338	252	234	----------	18
847,790	----------	33,352	71	71	----------	----------
3,376,711	----------	419,794	1,443	1,406	----------	37
599,670	----------	71,201	198	102	----------	96
758,114	----------	87,297	57	65	8	----------
419,823	4,971	----------	66	67	1	----------
6,734,090	----------	875,602	2,275	2,279	4	----------
2,387,871	----------	100,769	428	420	----------	8
699,606	----------	13,809	51	50	----------	1
2,222,429	----------	66,528	615	638	----------	7
891,681	----------	143,704	1,551	1,094	----------	457
999,670	----------	152,662	240	246	6	----------
2,197,785	----------	166,305	188	150	----------	38
1,982,544	----------	218,123	140	151	11	----------
2,098,378	----------	401,000	483	450	----------	33
1,011,115	----------	59,965	305	312	7	----------
717,342	----------	45,677	141	141	----------	----------
1,399,963	----------	91,045	369	379	10	----------
829,514	----------	139,416	330	323	----------	7
1,864,792	139,346	----------	529	509	----------	20
413,161	2,696	----------	32	34	2	----------
3,410,385	----------	204,755	533	535	2	----------
1,459,975	----------	81,756	332	339	7	----------
2,349,832	----------	310,462	1,392	1,415	23	----------
2,815,154	----------	90,109	600	463	137	----------
1,074,882	----------	23,795	792	709	83	----------
1,225,073	----------	135,538	1,172	994	178	----------
329,190	----------	3,380	35	37	----------	2
8,431,255	----------	924,390	19,228	19,134	94	----------
2,5[illegible]0,080	----------	45,160	291	333	----------	42
590,379	1,761	----------	65	70	----------	5
3,311,100	----------	100,230	7,299	7,258	41	----------

No. 4—Continued.

COUNTIES.	Acres of land, 1877.	Acres of land, 1878.	Increase.	Decrease.	Value of land, 1877.
Knox	193,273	184,585		8,688	$629,136
Larue	157,479	156,136		1,342	1,193,075
Laurel	195,518	234,861	39,343		563,526
Lawrence	361,000	311,467		49,533	1,025,255
Lee	130.717	118,515		12,202	357,798
Letcher	392,340	586,641	194,301		382,684
Lewis	305,043	289,103		15,940	1,547,294
Lincoln	188,839	191,476	2,637		2,806,164
Livingston	187,341	191,902	4,561		1,094,058
Logan	309,358	307,999		1,359	2,500,429
Lyon	132,979	133.914	935		670,758
Madison	257,722	254,864		2,858	4,769,530
Magoffin	230,714	232,497	1,783		505,710
Marion	199,395	187,897		11,498	1,925,037
Marshall	200,960	201,890	930		1,030,189
Martin	160,497	165,539	5,042		244,475
Mason	142,938	139,439		13,499	4,562,790
McCracken	149,894	148,802		1,092	1,495,255
McLean	137,971	134,285		3,686	1,028,088
Meade	168,486	166,312		2,174	1,381,994
Menifee	137,699	139,949	2,250		157,319
Mercer	131,400	142,929	11,529		2,287,065
Metcalfe	161,167	172,881	11,714		911,926
Monroe	187,516	192,498	4,982		926,896
Montgomery	113,036	111,349		1,687	2,296,817
Morgan	357,002	334,771		22,231	711,103
Muhlenburg	254,613	254.724	111		1,302,268
Nelson	252.372	245.246		7,126	2,892,085
Nicholas	115,957	115,115		842	2,141,540
Ohio	341,674	318,165		23,509	2,007,345
Oldham	113,393	112,211		1,182	2,067,438
Owen	183,048	183,952	904		1,798,773
Owsley	120,645	118,288		2,357	372,754
Pendleton	162,307	161,907		400	2,166,030
Perry	747,021	1,009,110	262,089		398,059
Pike	620,979	640,412	19,433		1,107,030
Powell	78,715	72,229		6,486	297,413
Pulaski	344,238	345,071	833		1.326,472
Robertson	61,430	60,460		970	647,490
Rockcastle	169,619	171,596	1,977		594,040
Rowan	180,113	177,708		2,405	351,980
Russell	156,007	151,523		4,484	751,824
Scott	170,439	171,228	789		4,402,500
Shelby	231,519	233,691	2,172		5,475,683
Simpson	137,937	140,090	2,153		1,278,934
Spencer	113,674	111,996		1,678	1,490,095
Taylor	152.040	154,663	2,623		790,656
Todd	203,856	226,273	22,417		1,695,615
Trigg	265,132	234,621		30,511	1,519,057
Trimble	90,335	90,941	606		1,248,835
Union	231,839	197,391		34,448	2,015,304
Warren	299,790	296,921		2,869	3,522,810
Washington	174,715	172,721		1,994	1,721,864
Wayne	258,209	282,611	24,402		1,105,566
Webster	184,531	178,681		5,850	1,113,210
Whitley	371,848	386,689	14,841		694,450
Wolfe	124,729	162,836	38,107		385,787
Woodford	114,874	116,651	1,777		4,028,155
Total	24,049,555	24,316,258	1,160,908	894,205	$205,650,667

No. 4—Continued.

Value of land, 1878.	Increase.	Decrease.	No. of town lots, 1877.	No. of town lots, 1878.	Increase.	Decrease.
$593,571	--------	$35,565	47	42	5	--------
1,201,204	$8,129	--------	104	100	4	--------
546,521	--------	17,005	48	57	--------	9
1,003,467	--------	21,788	99	103	--------	4
327.670	--------	30,128	67	72	--------	5
384,788	2,104	--------	33	28	5	--------
1,504,789	--------	42,505	408	352	56	--------
2,727,694	--------	78,470	210	260	--------	50
1,074,163	--------	19,895	339	333	6	--------
2,330,986	--------	169,443	603	623	--------	20
633,068	--------	37,690	498	382	116	--------
4,748,970	--------	20,560	389	376	13	--------
520,009	14,299	--------	32	33	--------	1
1,805,673	--------	119,364	414	470	--------	56
951,467	--------	78,722	334	329	5	--------
242,486	--------	1,989	37	39	--------	2
4,407,803	--------	154,987	1,499	1,548	--------	49
1,182,720	--------	312,535	2,429	2,596	--------	167
930,605	--------	97,483	468	461	7	--------
1,418,564	36,570	--------	214	191	23	--------
142,444	--------	14,875	52	48	4	--------
2,308,738	21,673	--------	377	353	24	--------
852,451	--------	59,475	63	61	2	--------
918,014	--------	8,882	112	131	--------	19
2,038,405	--------	258,412	344	333	11	--------
674,873	--------	36,230	56	45	11	--------
1,233,406	--------	68,862	362	420	--------	58
2.640,439	--------	251,646	433	420	13	--------
1,825,990	--------	215,550	194	196	--------	2
1,806,288	--------	201,057	509	487	22	--------
1,814,014	--------	253,424	301	374	--------	73
1,611,923	--------	186,850	245	209	36	--------
357,847	--------	14,907	24	25	--------	1
1,982,125	--------	183,905	439	412	27	--------
443,858	45,799	--------	16	17	--------	1
1,066,945	--------	40,085	52	47	5	--------
267,006	--------	30,407	19	19	--------	--------
1,249,358	--------	77,114	133	132	1	--------
542,060	--------	105,430	82	90	--------	8
559,546	--------	34,494	69	72	--------	3
304,298	--------	47,682	54	56	--------	2
741,828	--------	9,996	122	138	--------	16
4,272,925	--------	129,575	270	267	--------	3
5,303,839	--------	171,844	491	501	10	--------
1,235,946	--------	42,988	320	318	--------	2
1,341,498	--------	148,597	202	173	--------	29
734,178	--------	56,478	188	190	2	--------
1,618,075	--------	77,540	408	394	--------	14
1,394,157	--------	124,900	279	263	--------	16
1,200,700	--------	48,135	191	210	19	--------
1,838,920	--------	176,384	1,109	1,174	65	--------
3,317,797	--------	205,013	1,062	1,029	--------	33
1,659,771	--------	62,093	185	186	1	--------
1,058,048	--------	47,518	45	48	3	--------
966,401	--------	146,809	317	284	--------	33
682,020	--------	12,430	103	116	13	--------
373,094	--------	12,693	72	64	--------	8
3,692,725	--------	335,430	394	405	11	--------
$192,197,636	$361,102	$13,814,133	74,773	74,554	1,416	1,635

No. 4—Continued.

COUNTIES.	Value of town lots, 1877.	Value of town lots, 1878.	Increase.	Decrease.	Horses and mares, 1877.
Adair	$74,812	$78,830	$4,018	------	3,724
Allen	37,790	37,075	------	$715	3,461
Anderson	111,955	107,240	------	4,715	3,202
Ballard	102,395	95,905	------	6,490	3,599
Barren	247,430	229,780	------	17,650	5,673
Bath	160,255	145,730	------	14,525	4,252
Bell	12,520	13,255	735	------	794
Boone	218,940	194,855	------	24,085	4,338
Bourbon	912,130	807,425	------	104,705	5,137
Boyd	1,077,145	995,155	------	81,990	1,220
Boyle	702,435	667,270	------	35,165	2,683
Bracken	378,625	353,730	------	24,895	4,588
Breathitt	6,931	8,506	1,575	------	960
Breckinridge	288,340	289,900	1,560	------	4,799
Bullitt	80,307	77,605	------	2,702	2,644
Butler	54,820	50,085	------	4,735	3,017
Caldwell	206,282	191,675	------	14,607	2,524
Calloway	57,281	55,015	------	2,266	2,483
Campbell	5,062,495	4,874,855	------	187,640	3,064
Carroll	338,300	324,395	------	13,905	2,385
Carter	52,765	62,095	9,330	------	2,124
Casey	27,640	27,990	350	------	3,062
Christian	741,480	736,910	------	4,570	4,598
Clark	232,205	226,535	------	5,670	3,720
Clay	12,800	19,000	6,200	------	1,487
Clinton	20,370	19,560	------	810	1,561
Crittenden	111,306	99,400	------	11,906	2,883
Cumberland	52,200	49,250	------	2,950	1,876
Daviess	1,619,475	1,442,392	------	177,083	6,779
Edmonson	24,130	17,125	------	7,005	1,725
Estill	45,125	40,790	------	4,335	2,106
Elliott	7,725	5,605	------	2,120	1,201
Fayette	3,026,515	2,609,375	------	417,140	5,608
Fleming	306,845	286,060	------	20,785	5,466
Floyd	21,400	20,390	------	1,010	1,646
Franklin	1,391,595	1,372,200	------	19,395	4,225
Fulton	239,985	209,965	------	30,020	1,668
Gallatin	114,950	99,070	------	15,880	1,797
Garrard	207,275	191,400	------	15,875	3,955
Grant	152,420	156,060	3,640	------	4,833
Graves	305,905	293,795	------	12,110	5,047
Grayson	93,640	90,755	------	2,885	4,291
Green	36,505	31,350	------	5,155	2,992
Greenup	215,505	217,435	1,930	------	2,130
Hancock	159,040	135,615	------	23,425	1,923
Hardin	263,705	289,290	25,585	------	5,603
Harlan	5,025	5,000	------	25	856
Harrison	572,050	521,175	------	50,875	6,874
Hart	117,352	107,833	------	9,519	4,304
Henderson	1,529,352	1,444,993	------	84,359	3,898
Henry	288,002	290,717	2,715	------	4,862
Hickman	165,426	160,142	------	5,284	3,228
Hopkins	356,410	339,384	------	17,026	4,391
Jackson	5,830	6,020	190	------	1,016
Jefferson	36,842,565	31,996,175	------	4,846,390	6,993
Jessamine	203,435	194,767	------	8,668	3,247
Johnson	37,712	36,520	------	1,192	1,391
Kenton	10,164,170	9,858,835	------	305,335	3,970
Knox	32,282	41,175	8,893	------	1,479
Larue	63,770	67,265	3,495	------	3,315

No. 4—Continued.

Horses and mares, '76.	Increase	Decrease	Value of horses & mares, 1877	Value of horses & mares, 1878.	Increase.	Decrease.
3,840	116	------	$190,440	$175,080	------	$15,360
3,440	------	21	148,341	138,908	------	9,433
3,122	------	80	116,610	103,635	------	12,975
3,602	3	------	170,321	145,930	------	24,391
5,511	------	162	256,160	233,735	------	22,425
3,899	------	353	129,070	101,825	------	27,245
757	------	37	37,641	33,690	------	3,951
4,202	------	136	188,760	163,476	------	25,284
4,766	------	371	198,050	144,815	------	53,235
1,226	6	------	63,012	60,970	------	2,042
2,617	------	66	105,680	82,285	------	23,395
4,434	------	154	214,380	173,740	------	40,640
1,072	112	------	50,690	51,615	$925	------
4,837	38	------	272,050	251,595	------	20,455
2,798	154	------	129,130	130,854	1,724	------
2,963	------	54	133,246	121,453	------	11,793
2,503	------	21	131,353	117,762	------	13,591
2,610	127	------	120,785	114,175	------	6,610
3,076	12	------	156,600	148,747	------	7,853
2,278	------	107	102,830	90,595	------	12,235
2,288	164	------	105,840	104,837	------	1,003
3,166	104	------	126,775	114,588	------	12,187
4,677	79	------	232,790	205,755	------	27,035
3,724	4	------	111,265	106,170	------	5,095
1,532	45	------	75,558	72,229	------	3,329
1,624	63	------	76,545	70,095	------	6,450
2,809	------	74	154,955	138,535	------	16,420
1,760	------	116	87,988	76,780	------	11,208
6,507	------	272	328,220	279,832	------	48,388
1,752	27	------	80,925	73,504	------	7,421
2,128	22	------	78,425	69,258	------	9,167
1,300	99	------	61,698	60,931	------	767
5,438	------	170	268,885	205,055	------	63,830
5,360	------	106	243,582	216,527	------	27,055
1,692	46	------	78,318	79,107	789	------
4,146	------	79	189,062	166,988	------	22,074
1,658	------	10	76,200	67,010	------	9,190
1,672	------	125	85,385	67,330	------	18,055
3,791	------	164	157,360	132,080	------	25,280
4,919	86	------	204,889	176,894	------	27,995
4,961	------	86	230,025	194,825	------	35,200
4,331	40	------	197,005	179,315	------	17,690
2,949	------	43	116,470	99,980	------	16,490
2,130	------	------	113,775	106,910	------	6,865
2,064	141	------	103,375	94,890	------	8,485
6,112	509	------	237,305	243,577	6,272	------
874	18	------	43,802	41,887	------	1,915
7,040	166	------	275,540	243,655	------	31,885
4,250	------	54	194,603	173,255	------	21,348
4,079	181	------	179,615	157,015	------	22,600
4,929	67	------	199,822	186,188	------	13,634
2,293	65	------	103,629	100,041	------	3,588
4,375	------	16	172,565	153,430	------	19,135
1,176	160	------	51,015	53,115	2,100	------
6,943	------	50	366,575	346,695	------	19,880
3,067	------	180	123,540	99,510	------	24,030
1,479	88	------	72,878	73,298	420	------
3,592	------	378	208,615	180,830	------	27,785
1,776	297	------	72,909	73,254	345	------
3,392	77	------	154,275	152,530	------	1,745

No. 4—Continued.

COUNTIES.	Value of town lots, 1877.	Value of town lots, 1878.	Increase.	Decrease.	Horses and mares, 1877.
Laurel	$41,175	$40,275	-----	$900	1,504
Lawrence	98,925	85,440	-----	13,485	2,173
Lee	35,790	34,002	-----	1,788	565
Letcher	8,475	9,095	$620	-----	875
Lewis	178,648	165,980	-----	12,668	3,464
Lincoln	246,840	242,305	-----	4,535	4,072
Livingston	83,240	83,595	355	-----	2,040
Logan	424,920	382,551	-----	42,369	4,986
Lyon	87,854	85,694	-----	2,160	1,253
Madison	665,900	634,850	-----	31,050	6,485
Magoffin	12,100	12,200	100	-----	1,170
Marion	416,730	406,720	-----	10,010	4,608
Marshall	52,624	52,092	-----	532	2,022
Martin	8,182	9,025	843	-----	276
Mason	1,226,673	1,247,195	20,522	-----	5,344
McCracken	2,410,135	2,024,015	-----	386,120	1,732
McLean	126,562	104,495	-----	22,067	2,578
Meade	74,608	79,289	4,681	-----	3,039
Menifee	10,815	10,090	-----	725	558
Mercer	364,735	376,580	11,845	-----	3,121
Metcalfe	16,357	19,033	2,676	-----	2,837
Monroe	16,955	14,315	-----	2,640	3,026
Montgomery	388,055	344,565	-----	43,490	2,777
Morgan	19,180	19,900	720	-----	2,023
Munlenburg	181,591	162,865	-----	18,726	3,037
Nelson	337,165	322,730	-----	14,435	5,128
Nicholas	191,600	165,300	-----	26,300	4,228
Ohio	192,660	207,538	14,878	-----	5,382
Oldham	183,165	141,355	-----	41,810	2,701
Owen	122,629	120,840	-----	1,789	5,541
Owsley	11,250	11,050	-----	200	799
Pendleton	254,790	255,360	570	-----	5,564
Perry	4,195	5,120	925	-----	796
Pike	63,725	64,000	275	-----	1,666
Powell	5,460	5,125	-----	335	756
Pulaski	89,094	100,225	11,131	-----	4,704
Robertson	40,190	31,175	-----	9,015	2,203
Rockcastle	29,975	29,155	-----	820	1,874
Rowan	13,970	10,417	-----	3,553	874
Russell	19,365	18,060	-----	1,305	2,006
Scott	476,650	479,100	2,450	-----	5,482
Shelby	582,225	548,230	-----	33,995	5,985
Simpson	298,265	284,905	-----	13,360	2,977
Spencer	59,890	47,530	-----	12,360	3,026
Taylor	81,385	75,467	-----	5,918	2,535
Todd	159,375	155,025	-----	4,350	2,774
Trigg	129,060	119,815	-----	9,245	2,463
Trimble	61,200	57,535	-----	3,665	2,728
Union	347,440	319,805	-----	27,635	5,227
Warren	1,175,185	1,150,361	-----	24,824	6,230
Washington	100,000	100,050	50	-----	4,783
Wayne	31,450	30,985	-----	465	3,143
Webster	150,120	129,385	-----	20,785	3,619
Whitley	27,365	27,500	135	-----	2,016
Wolfe	20,178	19,723	-----	455	1,009
Woodford	383,250	367,675	-----	15,575	4,076
Total	$82,836,415	$75,464,406	$142,992	$7,515,001	365,537

No. 4—Continued.

Horses and mares, '78.	Increase.	Decrease.	Value of horses & mares, 1877.	Value of horses & mares, 1878.	Increase.	Decrease.
1,609	105	--------	$70,833	$71,210	$377	--------
2,338	165	--------	114,477	115,285	808	--------
626	61	--------	31,095	32,805	1,710	--------
963	88	--------	45,544	47,252	1,708	--------
3,522	58	--------	160,855	153,840	--------	$7,015
4,250	178	--------	158,155	149,845	--------	8,310
2,081	41	--------	115,065	108,455	--------	6,610
4,870	--------	116	190,982	170,847	--------	20,135
1,233	--------	20	62,149	56,234	--------	5,915
7,373	888	--------	305,680	269,330	--------	36,350
1,233	63	--------	61,252	58,571	--------	2,681
4,383	--------	225	165,508	141,840	--------	23,668
2,201	179	--------	104,300	93,321	--------	10,979
355	79	--------	15,210	18,273	3,063	--------
5,190	--------	154	221,010	178,635	--------	42,375
1,782	50	--------	91,900	58,850	--------	33,050
2,492	--------	86	135,175	111,795	--------	23,380
2,985	--------	54	137,492	127,568	--------	9,924
632	74	--------	20,290	18,730	--------	1,560
4,375	1,254	--------	161,166	150,755	--------	10,411
2,851	14	--------	132,496	119,349	--------	13,147
3,055	29	--------	135,557	125,767	--------	9,790
2,776	--------	1	67,422	51,630	--------	15,792
2,194	171	--------	98,984	93,043	--------	5,941
3,057	20	--------	132,356	123,002	--------	9,354
5,310	182	--------	202,950	199,270	--------	3,680
4,207	--------	21	141,550	120,520	--------	21,030
5,330	--------	52	254,815	225,300	--------	29,515
2,570	--------	131	110,410	89,855	--------	20,555
5,223	--------	318	211,102	179,989	--------	31,113
809	10	--------	44,981	43,540	--------	1,441
5,100	--------	464	255,495	223,430	--------	32,065
873	77	--------	42,965	43,935	970	--------
1,755	89	--------	100,125	101,785	1,660	--------
798	42	--------	29,093	24,755	--------	4,338
4,933	229	--------	205,259	197,927	--------	7,332
2,146	--------	57	94,185	73,405	--------	20,780
2,033	159	--------	92,670	90,940	--------	1,730
1,035	161	--------	43,303	42,710	--------	593
2,132	126	--------	101,639	95,884	--------	5,755
5,185	--------	297	218,850	173,500	--------	45,350
5,686	--------	299	238,155	209,675	--------	28,480
2,872	--------	105	122,572	112,443	--------	10,129
2,683	--------	343	72,460	62,435	--------	10,025
2,508	--------	27	112,501	105,728	--------	6,773
2,667	--------	107	134,525	120,175	--------	14,350
2,458	--------	5	131,638	119,927	--------	11,711
2,696	--------	32	130,650	115,835	--------	14,815
5,285	58	--------	186,125	168,290	--------	17,835
6,067	--------	163	263,080	256,235	--------	6,845
4,603	--------	180	174,351	151,545	--------	22,806
2,956	--------	187	144,365	120,020	--------	24,345
3,391	--------	228	168,040	133,425	--------	34,615
2,035	19	--------	93,550	87,770	--------	5,780
1,048	39	--------	50,967	48,567	--------	2,400
3,933	--------	143	189,410	141,170	--------	48,240
366,061	7,824	7,300	$16,253,886	$14,548,807	$22,871	$1,727,950

No. 4—Continued.

COUNTIES.	Mules, 1877.	Mules, 1878.	Increase.	Decrease.	Value of mules, 1877.
Adair	1,389	1,071		318	$61,395
Allen	1,910	1,773		137	92,281
Anderson	623	401		222	19,140
Ballard	2,246	2,391	145		117,610
Barren	1,763	1,600		163	81,382
Bath	1,148	740		408	30,395
Bell	181	213	32		8,853
Boone	814	704		110	40,535
Bourbon	2,141	1,447		694	91,480
Boyd	281	243		38	17,212
Boyle	1,052	1,011		41	40,650
Bracken	229	166		63	8,505
Breathitt	203	177		26	9,400
Breckinridge	1,431	1,448	17		94,910
Bullitt	642	714	72		34,542
Butler	1,066	1,076	10		49,428
Caldwell	1,662	1,774	112		95,563
Calloway	2,447	2,581	134		134,885
Campbell	472	474	2		26,936
Carroll	394	311		83	15,444
Carter	455	408		47	24,169
Casey	791	546		245	26,748
Christian	3,572	3,946	374		211,745
Clark	1,306	1,027		279	41,820
Clay	633	628		5	32,054
Clinton	496	409		87	22,730
Crittenden	1,776	1,798	22		108,097
Cumberland	625	623		2	28,542
Daviess	1,325	1,291		34	79,240
Edmonson	354	370	16		18,135
Estill	752	593		159	27,756
Elliott	164	154		10	7,040
Fayette	1,535	1,076		459	69,385
Fleming	1,062	527		535	42,005
Floyd	322	290		32	14,238
Franklin	785	541		244	32,953
Fulton	1,122	1,166	44		60,245
Gallatin	310	258		52	13,880
Garrard	1,480	1,134		346	60,285
Grant	696	506		190	23,593
Graves	3,392	4,321	929		233,135
Grayson	776	709		67	33,760
Green	1,978	867		1,111	38,770
Greenup	530	552	22		35,130
Hancock	496	427		69	26,510
Hardin	1,255	1,266	11		49,820
Harlan	182	183	1		9,380
Harrison	1,943	1,413		530	64,810
Hart	1,228	1,171		57	59,038
Henderson	2,641	2,519		122	139,100
Henry	659	543		116	26,465
Hickman	1,464	1,556	91		76,741
Hopkins	2,047	2,208	161		89,025
Jackson	183	177		6	8,405
Jefferson	2,134	2,067		67	116,875
Jessamine	988	640		348	38,035
Johnson	262	280	18		15,063
Kenton	408	342		66	22,615
Knox	721	690		31	31,620
Larue	578	551		27	24,356

No. 4—Continued.

Value of mules, 1878.	Increase.	Decrease.	Jennies, 1877.	Jennies, 1878.	Increase.	Decrease.
$43,426	----------	$17,969	54	42	----------	12
82,458	----------	9,823	23	26	3	----------
12,680	----------	6.460	16	15	----------	1
103,862	----------	13,748	31	25	----------	6
71,750	----------	9,632	3	3	----------	----------
18,635	----------	11,760	32	10	----------	22
9,681	$828	----------	20	17	----------	3
32,375	----------	8,160	21	3	----------	18
53,705	----------	37,775	52	40	----------	12
14,980	----------	2,232	5	2	----------	3
35,585	----------	5,065	36	2	----------	34
6,200	----------	2,305	8	8	----------	----------
8,055	----------	1,345	31	28	----------	3
87,435	----------	7,475	24	31	7	----------
37,294	2,752	----------	17	16	----------	1
46,928	----------	2,500	30	21	----------	9
90,057	----------	5,506	20	20	----------	----------
126,650	----------	8,235	25	26	1	----------
24,120	----------	2,816	4	----------	----------	4
12,352	----------	3,092	----------	----------	----------	----------
21,045	----------	3,124	12	14	2	----------
20,673	----------	6,075	59	38	----------	21
198,925	----------	12,820	28	21	----------	7
31.265	----------	10,555	18	23	5	----------
32,363	309	----------	23	33	10	----------
18,680	----------	4,050	17	18	1	----------
97,215	----------	10,882	18	13	----------	5
27,530	----------	1,012	10	11	1	----------
61,610	----------	17,630	10	11	1	----------
17,220	----------	915	10	22	12	----------
20,000	----------	7,756	12	24	12	----------
7,570	530	----------	22	27	5	----------
48,240	----------	21,145	4	5	1	----------
20,720	----------	21,285	5	2	----------	3
13,487	----------	751	26	23	----------	3
29,073	----------	3,880	57	44	----------	13
53,935	----------	6,310	9	8	----------	1
12,715	----------	1,165	----------	----------	----------	----------
48,245	----------	12,040	18	29	11	----------
18,395	----------	5,198	21	5	----------	16
189,644	----------	43,491	38	29	----------	9
30,560	----------	3,200	35	29	----------	6
31,755	----------	7,015	11	14	3	----------
33,790	----------	1,340	11	12	1	----------
23,040	----------	3,470	11	9	----------	2
52,040	2,220	----------	18	25	7	----------
9,630	250	----------	17	12	----------	5
46,735	----------	18,075	66	49	----------	17
56.803	----------	2,235	15	14	----------	1
113,755	----------	25,345	11	9	----------	2
23,475	----------	2,990	8	12	4	----------
77,315	574	----------	26	16	----------	10
84,852	4,173	----------	27	27	----------	----------
8,300	----------	105	25	26	1	----------
100,040	----------	16,835	7	3	----------	4
22,330	----------	15,705	34	20	----------	14
15,885	822	----------	17	20	3	----------
16,545	----------	6,070	12	17	5	----------
30,850	----------	770	37	36	----------	1
26,370	1,714	----------	9	11	2	----------

No. 4—Continued.

COUNTIES.	Mules, 1877.	Mules, 1878.	Increase.	Decrease.	Value of mules, 1877.
Laurel	427	448	21		$20,375
Lawrence	216	217	1		12,745
Lee	118	103		15	6,010
Letcher	212	213	1		11,680
Lewis	456	306		150	18,604
Lincoln	1,234	846		388	51,405
Livingston	1,365	1,427	62		91,300
Logan	3,337	3,056		281	133,658
Lyon	839	889	50		48,205
Madison	3,466	2,111		1,355	97,770
Magoffin	301	227		74	13,760
Marion	1,591	1,406		185	50,780
Marshall	1,585	1,712	127		86,622
Martin	69	55		14	3,790
Mason	1,128	880		248	43,235
McCracken	1,360	1,326		34	75,660
McLean	745	740		5	46,685
Meade	875	807		68	40,860
Menifee	102	62		40	3,520
Mercer	870	599		271	34,660
Metcalfe	789	737		52	36,903
Monroe	880	740		140	40,120
Montgomery	926	601		325	23,945
Morgan	490	444		46	21,860
Muhlenburg	1,692	1,873	181		88,162
Nelson	1,476	1,190		286	59,155
Nicholas	1,011	727		284	35,760
Ohio	1,307	1,359	52		68,405
Oldham	577	465		112	21,890
Owen	596	492		104	19,734
Owsley	243	216		27	13,830
Pendleton	493	272		221	20,745
Perry	191	188		3	11,081
Pike	400	381		19	24,990
Powell	178	138		40	6,620
Pulaski	1,745	1,432		313	71,901
Robertson	155	70		85	4,415
Rockcastle	415	381		34	19,560
Rowan	134	107		27	5,625
Russell	543	437		106	25,375
Scott	1,487	1,221		266	56,900
Shelby	1,024	760		264	43,517
Simpson	1,496	1,399		97	65,049
Spencer	670	519		151	15,200
Taylor	793	800	7		34,164
Todd	2,464	2,422		42	130,615
Trigg	2,352	2,480	128		134,657
Trimble	299	252		47	13,055
Union	1,848	1,759		89	75,210
Warren	3,096	3,012		84	151,120
Washington	789	685		104	25,624
Wayne	505	567	62		22,472
Webster	1,349	1,479	130		71,861
Whitley	707	659		48	35,130
Wolfe	177	186	9		7,950
Woodford	1,322	1,203		119	51,025
Total	120,435	109,171	3,044	14,308	$5,599,108

No. 4—Continued.

Value of mules, 1878.	Increase.	Decrease.	Jennies, 1877.	Jennies, 1878.	Increase.	Decrease.
$20,470	$95	----------	45	37	----------	8
12,770	25	----------	18	11	----------	7
5,275	----------	$735	7	7	----------	----------
12,296	616	----------	15	16	1	----------
13,950	----------	4,654	32	29	----------	3
36,415	----------	14,990	22	9	----------	13
86,880	----------	4,420	19	22	3	----------
119,895	----------	13,763	49	44	----------	5
44,690	----------	3,515	15	18	3	----------
80,940	----------	16,830	68	71	3	----------
11,065	----------	2,695	11	7	----------	4
41,235	----------	9,545	53	37	----------	16
85,045	----------	1,577	35	35	----------	----------
3,080	----------	710	9	6	----------	3
31,250	----------	11,985	6	3	----------	3
44,685	----------	30,975	35	20	----------	15
39,000	----------	7,685	10	6	----------	4
37,950	----------	2,910	10	6	----------	4
2,060	----------	1,460	4	2	----------	2
20,970	----------	13,690	14	13	----------	1
34,336	----------	2,567	32	22	----------	10
33,705	----------	6,415	47	36	----------	11
13,160	----------	10,885	34	7	----------	27
20,030	----------	1,830	25	22	----------	3
87.109	----------	1,053	37	38	1	----------
49,205	----------	9,950	42	22	----------	20
25,850	----------	9;910	2	----------	----------	2
64,190	----------	4,215	25	23	----------	2
16,730	----------	5,160	17	15	----------	2
12,195	----------	7,539	13	24	11	----------
11,953	----------	1,877	13	11	----------	2
15.835	----------	4,910	18	14	----------	4
10,645	----------	436	23	21	----------	2
24,530	----------	460	7	8	1	----------
4,180	----------	2,440	2	2	----------	----------
62,474	----------	9,427	94	92	----------	2
2,330	----------	2,085	4	4	----------	----------
17,290	----------	2,270	24	23	----------	1
4,727	----------	898	11	12	1	----------
20,557	----------	4,818	44	28	----------	16
44,375	----------	12,525	54	56	2	----------
32,720	----------	10,797	9	3	----------	6
58,824	----------	6,225	37	20	----------	17
11,510	----------	3,690	3	4	1	----------
32,645	----------	1,519	38	26	----------	12
119,590	----------	11,025	14	15	1	----------
127,834	----------	6,823	27	35	8	----------
10,665	----------	2,390	14	10	----------	4
64,325	----------	10,885	34	25	----------	9
147,705	----------	3,415	34	32	----------	2
22,450	----------	3,174	5	3	----------	2
25,255	2,783	----------	32	29	----------	3
63,160	----------	8,701	32	16	----------	16
31,675	----------	3,455	44	33	----------	11
8,090	140	----------	11	12	1	----------
47,340	----------	3,685	9	8	----------	1
$4,839,883	$17,831	$777,056	2,654	2,246	135	543

No. 4—Continued.

COUNTIES.	Value of jennies, 1877.	Value of jennies, 1878.	Increase.	Decrease.	Cattle, 1877.
Adair	$3,262	$2,086	--------	$1,176	4,744
Allen	395	330	--------	65	5.229
Anderson	1,230	1,045	--------	185	2,661
Ballard	935	1,180	$245	--------	4,314
Barren	80	105	25	--------	4,932
Bath	1,160	610	--------	550	6,400
Bell	465	280	--------	185	3,122
Boone	745	230	--------	515	6,458
Bourbon	2,115	1,795	--------	320	13,347
Boyd	145	65	--------	80	3,653
Boyle	950	100	--------	850	3,705
Bracken	115	80	--------	35	4,204
Breathitt	650	520	--------	130	4,949
Breckinridge	1,275	1,135	--------	140	3,510
Bullitt	1,056	740	--------	316	3,540
Butler	825	650	--------	175	4,399
Caldwell	866	1,050	184	--------	1,378
Calloway	1,955	1,820	--------	135	5,040
Campbell	430	--------	--------	430	1,705
Carroll	--------	--------	--------	--------	2,136
Carter	492	631	139	--------	3,558
Casey	1,297	970	--------	327	2,878
Christian	1,915	875	--------	1,040	1,187
Clark	305	500	195	--------	12,681
Clay	725	732	7	--------	6,169
Clinton	640	600	--------	40	3,150
Crittenden	540	245	--------	295	4,825
Cumberland	275	100	--------	175	3,057
Daviess	465	605	140	--------	3,910
Edmonson	405	667	262	--------	2,793
Estill	230	480	250	--------	4,261
Elliott	825	1,073	248	--------	3,152
Fayette	550	450	--------	100	9,502
Fleming	85	15	--------	70	5.407
Floyd	796	569	--------	227	6,612
Franklin	1,955	1,128	--------	827	3.894
Fulton	1,230	1,500	270	--------	4,499
Gallatin	--------	--------	--------	--------	6,235
Garrard	410	435	25	--------	7,749
Grant	990	385	--------	605	5.796
Graves	1,595	1,064	--------	531	5,930
Grayson	1,610	830	--------	780	5,868
Green	250	245	--------	5	1,822
Greenup	760	415	--------	345	3,342
Hancock	350	345	--------	5	1.137
Hardin	745	1,040	295	--------	5,799
Harlan	265	250	--------	15	4,215
Harrison	5,195	4,000	--------	1,195	8,275
Hart	360	246	--------	114	5,996
Henderson	465	175	--------	290	3,343
Henry	370	500	130	--------	4,610
Hickman	1,020	935	--------	85	2.565
Hopkins	675	690	15	--------	6,992
Jackson	540	530	--------	10	2.902
Jefferson	555	50	--------	505	7,164
Jessamine	1,850	995	--------	855	9,225
Johnson	560	542	--------	18	4,223
Kenton	575	370	--------	205	4,216
Knox	1,573	922	--------	651	4,836
Larue	175	451	276	--------	1,666

No. 4—Continued.

Cattle, 1878.	Increase.	Decrease.	Value of cattle over $50, 1877.	Value of cattle over $50, 1878.	Increase.	Decrease.
5,170	426	----------	$14,577	$17,587	$3,010	----------
5,092	----------	137	15,089	17,336	2,247	----------
3.346	685	----------	39,445	61,985	22,540	----------
6,053	1,739	----------	12,562	8,962	----------	$3,600
4,338	----------	594	22,838	23,535	697	----------
5,416	----------	984	68,110	56,095	----------	12,015
3,055	----------	67	9,339	8,032	----------	1,307
5,652	----------	806	81,035	75,405	----------	5,630
13,044	----------	303	386,489	313,135	----------	73,354
2,924	271	----------	21,475	24,205	2,730	----------
4,240	535	----------	68,710	82,290	13,580	----------
3,964	----------	240	15,610	13,760	----------	1,850
5,064	115	----------	21,037	20,525	----------	512
5,191	1,681	----------	32,330	41,560	9,230	----------
3,954	414	----------	28,255	33,965	5,710	----------
5,397	998	----------	20,424	20,118	----------	306
1,655	277	----------	22,047	19,884	----------	2,163
5,719	679	----------	4,340	3,710	----------	630
1,792	87	----------	32,412	31,197	----------	1,215
2,241	105	----------	29,630	30,190	560	----------
4,232	674	----------	25,449	26,064	615	----------
4,084	1,206	----------	20,245	19,468	----------	777
2,403	1,216	----------	12,250	11,455	----------	795
12,873	192	----------	314,165	260,530	----------	53,635
6,124	----------	45	30,199	25,133	----------	5,066
3,300	150	----------	8,770	8,650	----------	120
4,786	----------	39	12,355	13,366	1,011	----------
3,382	325	----------	9,967	9,275	----------	692
2,538	----------	372	27,075	27,571	496	----------
3,296	503	----------	12,296	10,584	----------	1,712
4,014	----------	247	24,894	22,083	----------	2,811
3,188	36	----------	13,228	12,047	----------	1,181
9,870	368	----------	243,665	210,245	----------	33,420
5,595	188	----------	71,563	70,738	----------	825
6,690	78	----------	22,164	20,316	----------	1,848
4,192	298	----------	83,681	88,748	5,067	----------
5,190	691	----------	10,570	11,870	1,300	----------
5,987	----------	248	45,616	41,560	----------	4,056
7,154	----------	595	90,080	82,235	----------	7,845
5,243	----------	553	137,779	105,414	----------	32,365
4,932	----------	998	7,499	4,578	----------	2,921
7,184	1,316	----------	22,085	23,339	1,254	----------
1,736	----------	86	13,810	11,670	----------	2,140
3,320	----------	22	32,697	30,045	----------	2,652
1,310	173	----------	8,495	9,827	1,332	----------
7,138	1,339	----------	25,016	30,202	5,186	----------
4,099	----------	116	8,879	9,194	315	----------
7,560	----------	715	128,820	132,115	3,295	----------
6,369	373	----------	16,656	19,140	2,484	----------
2,253	----------	1,090	16,238	15,205	----------	1,033
5,369	759	----------	65,964	84,591	18,627	----------
3,579	1,014	----------	16,938	18,353	1,415	----------
6.896	----------	96	6,300	5,588	----------	712
3,088	186	----------	9,240	11,030	1,790	----------
5,717	----------	1,447	70,970	72,510	1,540	----------
9,719	494	----------	102,859	88,240	----------	14,619
4,675	452	----------	17,784	16,760	----------	1,024
4,769	553	----------	55,130	56,905	1,775	----------
5,280	444	----------	12,502	16,834	4,332	----------
1,987	321	----------	16,598	19.555	2,957	----------

No. 4—Continued.

COUNTIES.	Value of jennies, 1877.	Value of jennies, 1878.	Increase.	Decrease.	Cattle, 1877.
Laurel	$1,428	$1,145		$283	4,152
Lawrence	612	370		242	6,082
Lee	180	165		15	1,884
Letcher	356	318		38	4,178
Lewis	985	825		160	5,624
Lincoln	1,350	465		885	7,343
Livingston	365	395	$30		4,003
Logan	2,945	1,720		1,225	10,421
Lyon	352	313		39	2,502
Madison	2,020	2,010		10	13,540
Magoffin	227	165		62	3,801
Marion	685	655		30	5,422
Marshall	630	652	22		3,423
Martin	408	210		198	1,520
Mason	210	95		115	5,901
McCracken	1,380	995		385	318
McLean	740	335		405	3,380
Meade	325	285		40	2,347
Menifee	90	50		40	1,282
Mercer	570	330		240	3,166
Metcalfe	1,365	670		695	3,615
Monroe	2,115	2,010		105	5,066
Montgomery	495	60		435	7,374
Morgan	550	290		260	5,076
Muhlenburg	2,745	2,365		380	5,381
Nelson	2,130	820		1,310	7,126
Nicholas	100			100	4,489
Ohio	720	425		295	8,857
Oldham	1,490	730		760	3,437
Owen	600	630	30		3,319
Owsley	362	192		170	2,538
Pendleton	320	235		85	5,047
Perry	392	278		114	4,529
Pike	280	150		130	4,554
Powell	87	72		15	1,570
Pulaski	3,354	2,892		462	9,343
Robertson	135	60		75	1,989
Rockcastle	605	505		100	4,457
Rowan	350	205		145	1,704
Russell	2,275	1,346		929	3,836
Scott	2,650	3,050	400		6,906
Shelby	350	450	100		9,061
Simpson	2,600	1,590	1,010		123
Spencer	200	165		35	3,092
Taylor	1,278	775		503	3,168
Todd	485	450		35	2,731
Trigg	1,535	1,455		80	3,668
Trimble	770	555		215	2,756
Union	1,380	1,050		330	3,983
Warren	1,780	1,490		290	8,396
Washington	275	175		100	3,201
Wayne	1,022	790		232	7,656
Webster	910	510		400	1,252
Whitley	1,400	960		440	6,711
Wolfe	280	240		40	2,572
Woodford	600	570		30	4,147
Total	$106,115	$80,084	$4,298	$30,329	537,886

No. 4—Continued.

Cattle 1878.	Increase.	Decrease.	Value of cattle over $50, 1877.	Value of cattle over $50, 1878.	Increase.	Decrease.
4,824	672	----------	$14,675	$17,775	$3,100	----------
6,981	899	----------	37,355	38,161	806	----------
1,927	43	----------	11,435	10,578	----------	$857
4,228	50	----------	10,030	9,275	----------	755
4,654	----------	970	37,579	34,497	----------	3,082
8,330	987	----------	126,436	119,110	----------	7,326
4,630	627	----------	17,220	17,638	418	----------
6,987	----------	3,434	28,086	17,740	----------	10,346
2,787	285	----------	14.327	16,054	1,727	----------
14,993	1,453	----------	217,250	245,200	27,950	----------
3,855	54	----------	18,379	19,277	898	----------
5,885	463	----------	30,440	34,650	4,210	----------
3,873	450	----------	4,775	4,377	----------	398
1,720	200	----------	6,750	6,302	----------	448
5,846	----------	55	65,995	63,060	----------	2,935
1,856	1,538	----------	3,530	2,310	----------	1,220
3,302	----------	78	8,358	7,575	----------	783
3,438	1,091	----------	37,583	31,179	----------	6,404
1,444	----------	----------	3,322	4,139	817	----------
11,132	7,966	----------	61,092	85,385	24,293	----------
1,522	----------	2,093	9,233	11,152	1,919	----------
5,311	245	----------	12,644	11,649	----------	995
7,741	367	----------	92,065	80,635	----------	11,430
5,268	192	----------	24,740	24,435	----------	305
5,754	373	----------	10,970	9,282	----------	1,688
8,518	1,392	----------	96,860	112,575	15,715	----------
4,573	84	----------	62,490	64,180	1,690	----------
9,385	528	----------	25,615	23,782	----------	1,833
3,632	195	----------	46,780	42,325	----------	4,455
3,142	----------	177	43,578	38,650	----------	4,928
2,505	----------	33	12,915	12,256	----------	659
5,521	474	----------	35,725	36,590	865	----------
4,719	190	----------	13,453	11,080	----------	2,373
4,487	----------	67	39,950	37,996	----------	1,954
1,302	----------	268	10,934	9,395	----------	1,539
9,943	600	----------	36,114	30,350	----------	5,764
1,987	----------	2	18,595	13,165	----------	5,430
4,638	181	----------	26,980	24,895	----------	2,085
1,775	71	----------	10,226	8,667	----------	1,559
3,779	----------	57	15,592	12,951	----------	2,641
7,298	392	----------	174,950	172,925	----------	2,025
9,766	705	----------	151,499	159,890	8,391	----------
101	----------	22	4,470	4,300	----------	170
3,617	525	----------	49,960	57,009	7,049	----------
3,080	----------	88	10,512	10,779	267	----------
1,294	----------	1,437	8,720	7,840	----------	880
3,837	169	----------	14,831	11,213	----------	3,618
3,085	329	----------	33,500	28,095	----------	5,405
5,243	1,260	----------	24,835	33,135	8,300	----------
8,311	----------	85	42,703	58,418	----------	----------
3,507	306	----------	51,437	54,533	15,715	----------
7,718	62	----------	45,122	43,008	2,114	----------
1,045	----------	207	6,575	6,047	----------	528
6,686	----------	25	20,905	21,830	925	----------
2,736	164	----------	21,422	19,520	----------	1,902
4,662	515	----------	141,310	131,785	----------	9,525
565,606	47,485	19,838	$5,019,072	$4,877,118	$242,264	$384,218

No. 4—Continued.

COUNTIES.	Stores, 1877.	Stores, 1878.	Increase.	Decrease.	Value of stores, 1877.	Value of stores, 1878.
Adair	24	26	2		$44,760	$39,500
Allen	23	23			29,555	27,510
Anderson	42	41		1	47,360	42,760
Ballard	42	47	5		57,500	49,050
Barren	60	64	4		99,850	82,630
Bath	39	44	5		45,500	40,100
Bell	8	12	4		6,950	8,006
Boone	52	55	3		76,055	75,390
Bourbon	109	87		22	204,825	160,100
Boyd	90	90			129,652	112,759
Boyle	66	67	1		132,625	127,355
Bracken	62	61		1	79,525	72,255
Breathitt	9	12	3		12,700	10,000
Breckinridge	70	55		15	101,300	86,005
Bullitt	25	26	1		20,475	23,190
Butler	23	22		1	43,103	37,572
Caldwell	45	35		10	57,042	61,178
Calloway	37	50	13		64,475	62,505
Campbell	228	215		13	131,510	158,950
Carroll	58	55		3	70,690	59,040
Carter	24	22		2	42,129	43,400
Casey	21	23	2		22,905	24,425
Christian	120	131	11		160,655	152,360
Clark	60	60			79,970	71,810
Clay	16	19	3		13,900	18,058
Clinton	12	10		2	25,600	23,300
Crittenden	37	37			48,700	42,225
Cumberland	19	16		3	27,500	19,550
Daviess	177	148		29	247,775	194,855
Edmonson	14	11		3	7,820	20,165
Estill	27	22		5	30,050	21,000
Elliott	12	10		2	8,580	13,000
Fayette	269	271	2		552,300	458,775
Fleming	58	56		2	66,975	61,000
Floyd	17	25	8		18,640	29,055
Franklin	81	78		3	207,908	203,850
Fulton	72	71		1	151,685	143,870
Gallatin	31	29		2	45,200	32,075
Garrard	41	45	4		56,100	57,890
Grant	44	53	9		63,525	68,485
Graves	90	83		7	122,738	104,733
Grayson	56	50		6	49,765	40,005
Green	37	33		4	21,415	16,825
Greenup	32	33	1		60,800	61,680
Hancock	31	33	2		30,000	33,400
Hardin	89	110	21		119,774	127,725
Harlan	12	5		7	10,950	6,800
Harrison	91	102	11		114,980	119,150
Hart	36	55	19		65,150	82,266
Henderson	123	101		22	207,381	183,439
Henry	68	72	4		95,655	96,815
Hickman	60	54		6	81,469	75,040
Hopkins	80	85	5		85,315	98,197
Jackson	8	8			7,100	7,250
Jefferson	1,915	1,932	17		7,260,225	7,179,625
Jessamine	50	55	5		98,740	74,425
Johnson	19	27	8		24,404	33,237
Kenton	511	447		64	579,905	637,620
Knox	31	31			14,538	15,303
Larue	26	27	1		38,160	35,300

No. 4—Continued.

Increase.	Decrease.	Value under the equalization law, 1877.	Value under the equalization law, 1878.	Increase.	Decrease.
------------	$5,260	$277,933	$271,254	------------	$6,679
------------	2,045	192.165	176,593	------------	15;572
------------	4,600	257,550	224,980	------------	32,570
------------	8,450	313,762	89,108	------------	224,654
------------	17,220	298,082	231,619	------------	66,463
------------	5,400	314,375	259,515	------------	54,860
$1,056	------------	14,226	16,895	$2,669	------------
------------	665	817,752	697,506	------------	120,246
------------	44,725	1,410,419	1,219,364	------------	191,055
------------	16,893	442,341	437,808	------------	4,533
------------	5,270	977,017	980,888	3,871	------------
------------	7,270	329,350	265,245	------------	64,105
------------	2,700	41,984	43,415	1,431	------------
------------	15,295	616,195	607,570	------------	8,625
2,715	------------	233,754	242,966	9,212	------------
------------	5,531	159,952	139,085	------------	20,867
4,136	------------	283,970	167,148	------------	116,822
------------	1,970	237,285	198,170	------------	39,115
27,440	------------	429,363	388,826	------------	40,537
------------	11,650	379,735	356,007	------------	23,728
1,271	------------	76,987	72,888	------------	4,099
1,520	------------	102,319	96,007	------------	6,312
------------	8,295	505,950	484,510	------------	21,440
------------	8,160	826,490	752,940	------------	73.550
4,158	------------	92,058	88,139	------------	3,919
------------	2,300	92,405	85,530	------------	6,875
------------	6,475	234,213	209,742	------------	24,471
------------	7,950	170,421	150,639	------------	19,782
------------	52,920	737.988	496,851	------------	241,137
12,345	------------	86,999	74,187	------------	12,812
------------	9,050	99,825	103,768	3,943	------------
4,420	------------	33,545	30,985	------------	2,560
------------	93.525	2,044,222	2,092,277	48,055	------------
------------	5,975	596,379	564,233	------------	32,146
10,415	------------	59,106	61,784	2,678	------------
------------	4,058	539,278	703.123	163,845	------------
------------	7,815	221,193	151,385	------------	69,808
------------	13,125	192,266	147,420	------------	44,846
1,790	------------	350,300	310,398	------------	39,902
4,960	------------	366,683	365,922	------------	761
------------	18,005	378,082	311,418	------------	66,664
------------	9,760	244,705	208,030	------------	36,675
------------	4,590	135,050	104,600	------------	30,450
280	------------	302,160	282,258	------------	19,902
3,400	------------	150,955	139,555	------------	11,400
7,951	------------	359,828	328,311	------------	31,517
------------	4,150	34,812	39,665	4,853	------------
4,170	------------	710,256	656,028	------------	54,228
17,116	------------	311,274	318,029	6,755	------------
------------	23,942	725,439	536,068	------------	189,371
1,160	------------	633,753	466,008	------------	167,745
------------	6,429	178,992	154,799	------------	24,193
12,882	------------	272,161	197,168	------------	74,993
150	------------	15,050	12,550	------------	2,500
------------	80,600	8,864,930	8,132,155	------------	732,775
------------	24,315	672,560	460,433	------------	212,127
8,833	------------	72,714	73,068	354	------------
57,715	------------	1,107,887	988,225	------------	119,662
765	------------	97,285	97,277	------------	8
------------	2,860	197,933	223,669	25,736	------------

No. 4—Continued.

COUNTIES.	Stores, 1877.	Stores, 1878.	Increase	Decrease.	Value of stores, 1877.	Value of stores, 1878.
Laurel	20	17	--------	3	$13,380	$14,445
Lawrence	13	30	17	--------	41,350	46,025
Lee	11	13	2	--------	10,150	12,425
Letcher	11	18	7	--------	8,935	12,423
Lewis	50	60	10	--------	44,807	45,325
Lincoln	68	69	1	--------	100,830	99,675
Livingston	39	38	--------	1	42,645	44,325
Logan	107	105	--------	2	78,595	72,100
Lyon	24	25	1	--------	40,890	37,550
Madison	101	100	0	1	150,990	161,790
Magoffin	9	11	2	--------	11,650	13,560
Marion	44	44	--------	--------	84,380	81,530
Marshall	33	38	5	--------	31,905	28,260
Martin	8	10	2	--------	4,610	6,705
Mason	152	157	5	--------	320,335	307,360
McCracken	186	187	1	--------	429,450	379,260
McLean	36	39	3	--------	42,310	38,665
Meade	26	28	2	--------	48,080	32,400
Menifee	14	10	--------	4	3,270	4,740
Mercer	56	63	7	--------	87,075	80,870
Metcalfe	26	21	--------	5	28,593	27,355
Monroe	29	30	1	--------	40,720	45,700
Montgomery	57	58	1	--------	72,200	67,600
Morgan	8	12	4	--------	18,510	19,775
Muhlenburg	56	60	4	--------	53,970	66,950
Nelson	71	68	--------	3	100,000	88,725
Nicholas	41	39	--------	2	52,170	48,500
Ohio	81	85	4	--------	79,650	80,530
Oldham	27	31	4	--------	29,750	25,275
Owen	54	56	2	--------	61,000	50,900
Owsley	14	14	--------	--------	13,052	10,650
Pendleton	68	70	2	--------	68,315	62,015
Perry	6	8	2	--------	10,160	12,163
Pike	22	23	1	--------	42,550	55,175
Powell	9	7	--------	2	4,288	2,375
Pulaski	48	43	--------	5	56,220	54,617
Robertson	13	12	--------	1	7,850	6,650
Rockcastle	27	36	9	--------	28,185	26,240
Rowan	4	10	6	--------	3,700	8,228
Russell	15	14	--------	1	27,900	19,550
Scott	67	73	6	--------	96,025	92,475
Shelby	76	79	3	--------	110,350	118,780
Simpson	52	58	6	--------	72,870	69,660
Spencer	20	23	3	--------	16,300	13,340
Taylor	18	17	--------	1	22,474	18,885
Todd	77	60	--------	17	94,950	101,150
Trigg	47	53	6	--------	75,575	71,925
Trimble	17	18	1	--------	15,500	18,530
Union	85	100	15	--------	124,270	131,810
Warren	129	130	1	--------	241,115	234,910
Washington	35	36	1	--------	30,200	26,050
Wayne	20	27	7	--------	30,450	28,500
Webster	45	39	--------	6	48,020	41,370
Whitley	24	23	--------	1	25,650	32,695
Wolfe	11	10	--------	1	13,199	14,440
Woodford	54	58	4	--------	99,025	76,525
Total	8,090	8,130	332	292	$15,932,226	$15,452,689

No. 4—Continued.

Increase.	Decrease.	Value under the equalization law, 1877.	Value under the equalization law, 1878.	Increase	Decrease.
$1,065	------------	$90,880	$85,210	------------	$5,670
4,675	------------	132,210	131,718	------------	492
2,275	------------	28,335	22,504	------------	5,831
3,488	------------	30,096	29,048	------------	1,048
518	------------	194,017	197,869	$3,852	------------
------------	$1,155	626,900	631,232	4,332	------------
1.680	------------	186,119	169,816	------------	16,303
------------	6,495	350,795	332,254	------------	18,541
------------	3,340	136,430	122,183	------------	14,247
10,800	------------	1,094,790	1,077,430	------------	17,360
1,910	------------	75,803	65,684	------------	10,119
------------	2,850	652,748	539,052	------------	113,696
------------	3,645	143,161	129,806	------------	13.355
2,095	------------	10,781	6,414	------------	4,367
------------	12,975	906,605	671,120	------------	235,485
------------	50,190	329,020	204,725	------------	124,295
------------	3,645	149,115	112,340	------------	36,775
------------	15,680	177,242	136,232	------------	41,010
1,470	------------	9,843	6,546	------------	3,297
------------	6,205	486,199	450,266	------------	35,933
------------	1,233	189,399	194,255	4,856	------------
4,980	------------	176,282	167,235	------------	9,047
------------	4,600	265,848	243,530	------------	22,318
1,265	------------	70,749	52,081	------------	18,668
12,980	------------	163,749	122,391	------------	41,358
------------	11,275	1,354,118	1,367,769	13,651	------------
------------	3,670	461,810	438,150	------------	23,660.
880	------------	337,694	302,351	------------	35,343
------------	4,475	392,400	285,025	------------	107,375
------------	10,100	275,558	235,945	------------	39,613
------------	2,402	23,539	24,552	1,013	------------
------------	6,300	237,639	200,278	------------	37,361
2,003	------------	25,904	20,950	------------	4,954
12,625	------------	119,660	98,400	------------	21,260
------------	1,913	35,728	38,233	2,505	------------
------------	1,603	159,421	148,849	------------	10,572
------------	1,200	56,920	41,225	------------	15,695
------------	1,945	116,932	127,010	10,078	------------
4,528	------------	24,645	18,762	------------	5,883
------------	8,350	163,080	163,140	60	------------
------------	3,550	646,550	615,900	------------	30,650
8,430	------------	951,657	980,281	28,624	------------
------------	3,210	272,217	225,862	------------	46,355
------------	3,040	256,422	222,580	------------	33,842
------------	3,589	188,352	158,796	------------	29,556
6,200	------------	498,423	513,065	14,642	------------
------------	3,650	296,886	246,126	------------	50,760
3,030	------------	151,650	168,235	16,585	------------
7,540	------------	436,498	416,647	------------	19,851
------------	6,205	1,008,747	823,812	------------	184,935
------------	4,150	374,576	268,319	------------	106,257
------------	1,950	221,093	192,916	------------	28,177
------------	6,650	201,520	165,274	------------	36,246
7,045	------------	86,190	95,845	9,655	------------
1,241	------------	65,040	74,912	9,872	------------
------------	22,500	890,240	827,600	------------	62,640
$293,451	$772,988	$47,930,888	$43,193,754	$393,127	$5,130,261

No. 4—Continued.

COUNTIES.	Value of carriages, &c., 1877.	Value of carriages, &c., 1878.	Increase.	Decrease.	Value of gold and silver watches, gold and silver plate, pianos, &c., 1877.	Value of gold and silver watches, gold and silver plate, pianos, &c., 1878.
Adair	$6,280	$6,710	$430	-------	$11,990	$12,352
Allen	5,023	4,875	-------	$148	5,803	5,625
Anderson	13,140	11,970	-------	1,170	6,380	7,275
Ballard	10,339	10,013	-------	326	12,800	10,151
Barren	13,050	10,705	-------	2,345	17,133	13,897
Bath	7,185	5,395	-------	1,790	8,410	7,585
Bell	98	125	27	-------	611	683
Boone	22,795	21,045	-------	1,750	19,772	17,957
Bourbon	50,655	36,880	-------	13,775	57,130	35,190
Boyd	9,335	9,577	242	-------	38,808	34,623
Boyle	28,365	16,405	-------	11,960	18,555	16,895
Bracken	22,176	18,905	-------	3,271	18,507	13,435
Breathitt	-------	-------	-------	-------	1,028	1,109
Breckinridge	8,595	7,980	-------	615	24,180	22,430
Bullitt	8,890	10,605	1,715	-------	14,269	14,183
Butler	1,017	1,111	94	-------	6,179	5,186
Caldwell	9,215	6,771	-------	2,444	11,604	8,807
Calloway	10,205	11,470	1,265	-------	13,210	12,170
Campbell	15,275	17,235	1,960	-------	44,698	62,175
Carroll	9,030	9,504	474	-------	16,267	15,931
Carter	970	120	-------	850	6,670	5,765
Casey	4,472	4,601	129	-------	3,244	2,727
Christian	40,215	36,265	-------	3,950	43,715	35,527
Clark	14,820	18,255	3,435	-------	16,725	16,740
Clay	40	75	35	-------	4,273	4,810
Clinton	1,085	465	-------	620	1,910	1,905
Crittenden	5,128	4,914	-------	214	11,570	9,409
Cumberland	1,845	1,720	-------	125	5,983	4,768
Daviess	42,315	36,539	-------	5,776	40,388	32,502
Edmonson	988	2,145	1,157	-------	2,393	2,262
Estill	2,240	2,200	-------	40	4,569	4,129
Elliott	-------	5	5	-------	699	884
Fayette	52,175	45,375	-------	6,800	61,130	53,785
Fleming	27,465	21,859	-------	5,606	22,060	18,768
Floyd	230	259	29	-------	2,071	1,894
Franklin	31,674	30,854	-------	820	56,631	54,885
Fulton	10,460	10,660	200	-------	12,645	12,020
Gallatin	4,415	2,650	-------	1,765	10,819	9,575
Garrard	23,815	18,455	-------	5,360	21,285	20,405
Grant	11,622	10,502	-------	1,120	10,589	9,617
Graves	23,408	17,126	-------	6,282	20,916	16,242
Grayson	1,820	1,915	95	-------	8,725	8,200
Green	2,440	4,170	1,730	-------	5,210	4,260
Greenup	5,580	5,320	-------	260	13,830	11,538
Hancock	5,055	6,055	1,000	-------	8,785	8,875
Hardin	11,925	11,235	-------	690	15,971	15,065
Harlan	-------	-------	-------	-------	388	206
Harrison	21,475	20,135	-------	1,340	33,140	28,325
Hart	9,450	9,040	-------	410	12,979	11,322
Henderson	35,108	31,990	-------	3,118	49,500	41,824
Henry	24,000	24,531	531	-------	26,526	25,777
Hickman	6,352	23,698	17,346	-------	12,551	12,835
Hopkins	10,035	9,495	-------	540	14,735	14,647
Jackson	-------	-------	-------	-------	845	805
Jefferson	166,990	154,805	-------	12,185	267,238	243,405
Jessamine	22,505	19,905	-------	2,600	18,925	17,265
Johnson	215	418	203	-------	3,898	3,553
Kenton	88,225	84,740	-------	3,485	190,675	173,103
Knox	917	915	-------	2	4,018	3,602
Larue	3,135	4,450	1,315	-------	6,317	6,474

No. 4—Continued.

Increase.	Decrease.	Total valuation, 1877.	Total valuation, 1878.	Increase.	Decrease.
$362		$1,834,482	$1,745,892		$88,590
	$178	1,639,575	1,551,297		88,278
895		1,736,705	1,640,644		96,061
	2,649	2,456,797	2,160,895		295,902
	3,236	3,140,722	2,808,748		331,974
	825	2,533,500	2,194,702		338,798
72		444,618	383,557		61,061
	1,815	5,661,552	5,230,303		431,249
	21,940	10,988,810	9,664,786		1,324,024
	4,185	3,145,549	2,991,163		154,386
	1,660	4,556,299	4,361,701		194,598
	5,072	3,176,844	2,758,076		418,768
81		654,743	630,316		24,427
	1,750	3,498,774	3,366,420		132,354
	86	2,126,381	2,024,600		101,781
	993	1,419,640	1,269,943		149,697
	2,797	1,944,449	1,695,332		249,117
	1,040	2,003,566	1,842,400		161,166
17,477		9,260,341	8,962,036		298,305
	336	2,456,761	2,221,469		235,292
	905	1,460,367	1,439,604		20,763
	517	1,284,739	1,206,843		77,896
	8,188	4,984,255	4,979,876		4,379
15		5,467,018	4,987,505		479,513
537		1,046,924	902,815		144,109
	5	862,315	824,610		37,705
	2,161	1,894,181	1,728,030		166,151
	1,215	1,265,863	1,187,402		78,461
	7,886	6,919,446	5,949,468		969,978
	131	904,960	817,529		87,431
	440	1,158,525	1,041,822		116,703
185		548,192	551,923	$3,731	
	7,345	13,928,519	12,457,667		1,470,852
	3,292	3,865,599	3,647,791		217,808
	177	930,378	926,467		3,911
	1,746	4,823,694	4,873,278	49,584	
	625	1,819,598	1,553,896		265,702
	1,244	1,664,854	1,412,065		252,789
	880	3,331,000	3,059,328		271,672
	972	3,172,757	2,894,218		278,539
	4,674	3,822,681	3,231,823		590,858
	525	1,724,195	1,594,054		130,141
	950	1,132,939	1,022,197		110,742
	2,292	2,271,245	2,148,754		122,491
90		1,461,495	1,281,116		180,379
	906	2,809,535	2,963,277	153,742	
	182	523,966	525,793	1,827	
	4,815	5,541,406	5,181,703		359,703
	1,657	2,328,593	2,237,909		90,684
	7,676	5,542,492	4,874,296		668,196
	749	4,265,820	4,013,756		252,064
284		1,741,795	1,698,040		43,755
	88	2,367,832	2,128,524		239,308
	40	430,595	428,790		1,805
	23,833	63,312,568	56,656,715		6,655,853
	1,660	3,897,689	3,547,950		349,739
	345	833,846	843,660	9,814	
	17,572	15,829,127	15,308,273		520,854
	416	896,780	873,703		23,077
167		1,698,094	1,737,268	39,174	

No. 4—Continued.

COUNTIES	Value of carriages, 1877.	Value of carriages, 1878.	Increase.	Decrease.	Value of gold and silver watches, gold and silver plate, pianos, &c., 1877	Value of gold and silver watches, gold and silver plate, pianos, &c., 1878.
Laurel	$800	$470		$330	$3,785	$2,970
Lawrence	1,243	2,635	$1,392		9,847	8,492
Lee					2,912	2,194
Letcher	125	100		25	1,022	903
Lewis	9,078	9,797	719		18,356	18,135
Lincoln	25,115	24,435		680	26,517	24,120
Livingston	4,370	4,710	340		14,901	14,233
Logan	20,315	19,890		425	20,363	18,955
Lyon	2,861	3,030	169		8,336	8,438
Madison	35,820	31,030		4,790	29,830	28,690
Magoffin	240	140		100	1,330	1,111
Marion	13,930	10,715		3,215	11,951	11,040
Marshall	5,057	4,905		152	8,090	7,182
Martin					580	625
Mason	43,430	34,900		8,530	44,645	34,145
McCracken	19,095	18,135		960	47,675	43,155
McLean	8,770	8,115		655	6,995	7,012
Meade	7,930	9,296	1,366		9,381	12,202
Menifee	195			195	689	297
Mercer	21,235	23,015	1,780		17,786	16,370
Metcalfe	3,470	3,335		135	7,419	6,926
Monroe	1,530	1,765	235		3,060	3,675
Montgomery	9,570	6,345		3,225	16,177	11,295
Morgan	480	165		315	2,749	2,507
Muhlenburg	6,362	7,322	960		12,856	13,111
Nelson	24,735	23,125		1,610	45,789	41,481
Nicholas	13,140	11,410		1,730	14,330	11,310
Ohio	9,860	11,500	1,640		15,705	12,530
Oldham	10,330	9,190		1,140	16,790	11,858
Owen	6,435	6,315		120	8,516	12,134
Owsley	25	75	50		1,807	2,087
Pendleton	5,265	5,310	45		15,345	14,085
Perry	3	35	32		111	259
Pike	745	835	90		3,606	3,765
Powell					273	148
Pulaski	3,170	2,692		478	8,250	8,708
Robertson	3,380	2,600		780	4,015	2,945
Rockcastle	325	25		300	4,140	3,432
Rowan	330	468	138		1,306	1,627
Russell	1,185	1,145		40	2,598	2,440
Scott	37,215	27,335		9,880	33,030	27,365
Shelby	50,230	45,142		5,088	31,894	29,617
Simpson	22,546	20,856		1,690	14,572	10,918
Spencer	8,360	7,819		541	8,137	6,554
Taylor	5,300	5,662	362		7,185	6,750
Todd	26,925	27,265	340		17,950	18,275
Trigg	11,862	12,501	639		13,493	11,838
Trimble	6,160	6,045		115	12,575	11,457
Union	18,920	17,880		1,040	26,470	23,250
Warren	26,305	27,605	1,300		37,804	38,060
Washington	6,245	6,375	130		8,787	7,250
Wayne	6,440	1,175		5,265	3,277	2,773
Webster	8,755	7,640		1,115	8,146	7,195
Whitley	415	505	90		1,120	1,560
Wolfe	570	590	20		2,133	1,934
Woodford	31,075	28,485		2,590	33,550	29,555
Total	$1,552,487	$1,436,997	$45,316	$160,806	$2,131,872	$1,928,302

No. 4—Continued.

Increase.	Decrease.	Total valuation, 1877.	Total valuation, 1878.	Increase.	Decrease.
----------	$815	$820,857	$800,491	----------	$20,366
----------	1,355	1,474,019	1,444,363	----------	29,656
----------	718	483,705	447,618	----------	36,087
----------	119	498,947	505,498	$6,551	----------
----------	221	2,210,223	2,145,007	----------	65,216
----------	2,397	4,169,712	4,055,296	----------	114,416
----------	668	1,649,283	1,604,210	----------	45,073
----------	1,408	3,751,088	3,466,938	----------	284,150
$52	----------	1,072,212	1,007,254	----------	64,958
----------	1,140	7,369,580	7,280,240	----------	89,340
----------	219	700,451	701,782	1,331	----------
----------	911	3,352,189	3,073,110	----------	279,079
----------	908	1,467,353	1,357,107	----------	110,246
45	----------	294,786	293,120	----------	1,666
----------	10,500	7,434,928	6,975,563	----------	459,365
----------	4,520	4,903,100	3,958,850	----------	944,250
17	----------	1,552,798	1,359,937	----------	192,861
2,821	----------	1,915,495	1,884,965	----------	30,530
----------	392	209,353	189,096	----------	20,257
----------	1,416	3,521,583	3,513,279	----------	8,304
----------	493	1,337,161	1,268,862	----------	68,299
615	----------	1,355,879	1,323,835	----------	32,044
----------	4,882	3,232,594	2,857,125	----------	375,469
----------	242	968,905	907,099	----------	61,806
255	----------	1,955,029	1,827,803	----------	127,226
----------	4,308	5,114,987	4,846,139	----------	268,848
----------	3,020	3,114,490	2,711,210	----------	403,280
----------	3,175	2,992,469	2,734,434	----------	258,035
----------	4,932	2,880,443	2,436,357	----------	444,086
3,618	----------	2,547,925	2,269,521	----------	278,404
280	----------	494,515	474,202	----------	20,313
----------	1,260	3,059,669	2,795,263	----------	264,406
148	----------	506,323	548,323	42,000	----------
159	----------	1,502,661	1,453,581	----------	49,080
----------	125	389,896	351,289	----------	38,607
458	----------	1,959,255	1,858,092	----------	101,163
----------	1,070	877,175	715,615	----------	161,560
----------	708	913,412	879,038	----------	34,374
321	----------	455,435	400,109	----------	55,326
----------	158	1,110,833	1,076,901	----------	33,932
----------	5,665	6,145,320	5,908,950	----------	236,370
----------	2,277	7,635,560	7,428,624	----------	206,936
----------	3,654	2,154,095	2,025,304	----------	128,791
----------	1,583	1,976,964	1,770,440	----------	206,524
----------	435	1,253,807	1,149,665	----------	104,142
325	----------	2,767,583	2,680,910	----------	86,673
----------	1,655	2,328,594	2,116,791	----------	211,803
----------	1,118	1,673,895	1,617,652	----------	56,243
----------	3,220	3,256,452	3,015,112	----------	241,340
256	----------	6,470,649	6,056,393	----------	414,256
----------	1,537	2,493,359	2,296,518	----------	196,841
----------	504	1,611,257	1,503,470	----------	107,787
----------	951	1,777,157	1,520,407	----------	256,750
440	----------	986,175	982,360	----------	3,815
----------	199	567,526	561,110	----------	6,416
----------	3,995	5,847,640	5,343,430	----------	504,210
$29,974	$233,544	$383,012,736	$354,019,676	$307,754	$29,300,814

No. 4—Continued.

COUNTIES.	Tax at 40 cts. on the $100, 1877.	Tax at 40 cts. on the $100, 1878.	Increase.	Decrease.	Auditor's list, 1877.	Auditor's list, 1878.
Adair	$7,337 93	$6,983 57		$354 36		
Allen	6,558 30	6,205 19		353 11		
Anderson	6,946 82	6,562 57		384 25		
Ballard	9,827 19	8,643 58		1,183 61		
Barren	12,562 89	11,234 99		1,327 90		
Bath	10,134 00	8,778 81		1,355 19		
Bell	1,778 47	1,534 23		244 24		
Boone	22,646 21	20,921 21		1,725 00		
Bourbon	43,955 24	38,659 14		5,296 10		
Boyd	12,582 20	11,964 65		617 55		
Boyle	18,225 20	17,446 80		778 40		
Bracken	12,707 38	11,032 31		1,675 07		
Breathitt	2,618 97	2,521 26		97 71		
Breckinridge,	13,995 10	13,465 68		529 42		
Bullitt	8,505 52	8,098 40		407 12		
Butler	5,678 56	5,079 77		598 79		
Caldwell	7,777 80	6,781 33		996 47		
Calloway	8,014 25	7,369 60		644 65		
Campbell	37,041 36	35,848 15		1,193 21		
Carroll	9,827 04	8,885 88		941 16		
Carter	5,841 47	5,758 42		83 05		
Casey	5,138 96	4,827 37		311 59		
Christian	19,937 02	19,919 50		17 52		
Clark	21,868 07	19,950 02		1,918 05		
Clay	4,187 70	3,611 26		576 44		
Clinton	3,449 26	3,298 44		150 82		
Crittenden	7,576 72	6,912 12		664 60		
Cumberland	5,063 45	4,749 60		313 85		
Daviess	27,677 78	23,797 87		3,879 91		
Edmonson	3,619 84	3,270 12		349 72		
Estill	4,634 10	4,167 29		466 81		
Elliott	2,192 77	2,207 69	$14 92			
Fayette	55,714 08	49,830 67		5,883 41		
Fleming	15,462 39	14,591 16		871 23		
Floyd	3,721 51	3,705 87		15 64		
Franklin	19,294 78	19,493 12	198 34			
Fulton	7,278 39	6,215 58		1,062 81		
Gallatin	6,659 42	5,648 26		1,011 16		
Garrard	13,324 00	12,237 31		1,086 69		
Grant	12,691 03	11,576 87		1,114 16		
Graves	15,290 72	12,927 29		2,363 43		
Grayson	6,896 78	6,376 22		520 56		
Green	4,531 76	4,088 79		442 97		
Greenup	9,084 98	8,595 02		489 96		
Hancock	5,845 98	5,124 46		721 52		
Hardin	11,238 14	11,853 11	614 97			
Harlan	2,095 86	2,103 17	7 31			
Harrison	22,165 62	20,726 80		1,438 82		
Hart	9,314 37	8,951 64		362 73		
Henderson	22,169 97	19,497 18		2,672 79		
Henry	17,063 28	16,055 02		1,008 26		
Hickman	6,967 18	6,792 16		175 02		
Hopkins	9,471 33	8,514 10		957 23		
Jackson	1,722 38	1,715 16		7 22		
Jefferson	253,250 27	226,626 86		26,623 41		
Jessamine	15,590 76	14,191 80		1,398 96		
Johnson	3,335 38	3,374 64	39 26			
Kenton	63,316 51	61,233 10		2,083 41		
Knox	3,587 12	3,494 81		92 31		
Larue	6,792 38	6,949 07	156 69			

No. 4—Continued.

Increase.	Decrease.	Total tax for 1877.	Total tax for 1878.	Increase.	Decrease.
		$7,337 93	$6,983 57		$354 36
		6,558 30	6,205 19		353 11
		6 946 82	6,562 57		384 25
		9,827 19	8,643 58		1,183 61
		12,562 89	11,234 99		1,327 90
		10,134 00	8,778 81		1,355 19
		1,778 47	1,534 23		244 24
		22,646 21	20,921 21		1,725 00
		43,955 24	38,659 14		5,296 10
		12,582 20	11,964 65		617 55
		18,225 20	17,446 80		778 40
		12,707 38	11,032 31		1,675 07
		2,618 97	2,521 26		97 71
		13,995 10	13,465 68		529 42
		8,505 52	8,098 40		407 12
		5,678 56	5,079 77		598 79
		7,777 80	6,781 33		996 47
		8,014 25	7,369 60		644 65
		37,041 36	35,848 15		1,193 21
		9,827 04	8,885 88		941 16
		5,841 47	5,758 42		83 05
		5,138 96	4,827 37		311 59
		19,937 02	19,919 50		17 52
		21,868 07	19,950 02		1,918 05
		4,187 70	3,611 26		576 44
		3,449 26	3,298 44		150 82
		7,576 72	6,912 12		664 60
		5,063 45	4,749 60		313 85
		27,677 78	23,797 87		3,879 91
		3,619 84	3,270 12		349 72
		4,634 10	4,167 29		466 81
		2,192 77	2,207 69	14 92	
		55,714 08	49,830 67		5,883 41
		15,462 39	14,591 16		871 23
		3,721 51	3,705 87		15 64
		19,294 78	19,493 12	198 34	
		7,278 39	6,215 58		1,062 81
		6,659 42	5,648 26		1,011 16
		13,324 00	12,237 31		1,086 69
		12,691 03	11,576 87		1,114 16
		15,290 72	12,927 29		2,363 43
		6,896 78	6,376 22		520 56
		4,531 76	4,088 79		442 97
		9,084 98	8,595 02		489 96
		5,845 98	5,124 46		721 52
		11,238 14	11,853 11	614 97	
		2,095 86	2,103 17	7 31	
		22,165 62	20,726 80		1,438 82
		9,314 37	8,951 64		362 73
		22,169 97	19,497 18		2,672 19
		17,063 28	16,055 02		1,008 26
		6,967 18	6,792 16		175 02
		9,471 33	8,514 10		957 23
		1,722 38	1,715 16		7 22
		253,250 27	226,626 86		26,623 41
		15,590 76	14,191 80		1,398 96
		3,335 38	3,374 64	39 26	
		63,316 51	61,233 10		2,083 41
		3,587 12	3,494 81		92 31
		6,792 38	6,949 07	156 69	

No. 4—Continued.

COUNTIES.	Tax at 40 cts. on the $100, 1877.	Tax at 40 cts. on the $100, 1878.	Increase.	Decrease.	Auditor's list, 1877.	Auditor's list, 1878.
Laurel	$3,283 43	$3,201 96		$81 47		
Lawrence	5,896 08	5,777 45		118 63		
Lee	1,934 82	1,790 47		144 35		
Letcher	1,995 79	2,021 99	$26 20			
Lewis	8,840 89	8,580 03		260 86		
Lincoln	16,678 85	16,221 18		457 67		
Livingston	6,597 13	6,416 85		180 28		
Logan	15,004 35	13,867 75		1,136 60		
Lyon	4,288 85	4,029 02		259 83		
Madison	29,478 32	29,120 96		357 36		
Magoffin	2,801 80	2,807 13	5 33			
Marion	13,408 76	12,292 44		1,116 32		
Marshall	5,869 41	5,428 43		440 98		
Martin	1,179 15	1,172 48		6 67		
Mason	29,739 71	27,902 25		1,837 46		
McCracken	19,612 40	15,835 40		3,777 00		
McLean	6,211 19	5,439 75		771 44		
Meade	7,661 98	7,539 86		122 12		
Menifee	837 41	756 38		81 03		
Mercer	14,086 33	14,053 12		33 21		
Metcalfe	5,348 64	5,075 45		273 19		
Monroe	5,423 52	5,295 34		128 18		
Montgomery	12,930 38	11,428 50		1,501 88		
Morgan	3,875 62	3,628 40		247 22		
Muhlenburg	7,820 12	7,311 21		508 91		
Nelson	20,459 95	19,384 56		1,075 39		
Nicholas	12,457 95	10,844 84		1,613 11		
Ohio	11,969 88	10,937 74		1,032 14		
Oldham	11,521 77	9,745 43		1,776 34		
Owen	10,191 70	9,078 08		1,113 62		
Owsley	1,978 06	1,896 81		81 25		
Pendleton	12,238 68	11,181 05		1,057 63		
Perry	2,025 29	2,193 29	168 00			
Pike	6,010 64	5,814 32		196 32		
Powell	1,559 58	1,405 16		154 42		
Pulaski	7,837 02	7,432 37		404 65		
Robertson	3,508 70	2,862 46		646 24		
Rockcastle	3,653 65	3,516 15		137 50		
Rowan	1,821 74	1,600 44		221 30		
Russell	4,443 33	4,307 60		135 73		
Scott	24,581 28	23,635 80		945 48		
Shelby	30,542 24	29,714 50		827 74		
Simpson	8,616 38	8,101 22		515 16		
Spencer	7,907 86	7,081 76		826 10		
Taylor	5,015.23	4,598 66		416 57		
Todd	11,070 33	10,723 64		346 69		
Trigg	9,314 38	8,467 16		847 22		
Trimble	6,695 58	6,470 60		224 98		
Union	13,025 80	12,060 45		965 35		
Warren	25,882 60	24,225 57		1,657 03		
Washington	9,973 43	9,186 07		787 36		
Wayne	6,445 03	6,013 88		431 15		
Webster	7,108 63	6,081 63		1,027 00		
Whitley	3,944 70	3,929 44		15 26		
Wolfe	2,270 10	2,244 44		25 66		
Woodford	23,390 56	21,373 72		2,016 84		
Total	$1,532,050 94	$1,416,078 70	$1,231 02	$117,203 26		

No. 4—Continued.

Increase.	Decrease.	Total tax, 1877.	Total tax, 1878.	Increase.	Decrease.
-----------	-----------	$3,283 43	$3,201 96	-----------	$81 47
-----------	-----------	5,896 08	5,777 45	-----------	118 63
-----------	-----------	1,934 82	1,790 47	-----------	144 35
-----------	-----------	1,995 79	2,021 99	$26 20	-----------
-----------	-----------	8,840 89	8,580 03	-----------	260 86
-----------	-----------	16,678 85	16,221 18	-----------	457 67
-----------	-----------	6,597 13	6,416 85	-----------	180 28
-----------	-----------	15,004 35	13,867 75	-----------	1,136 60
-----------	-----------	4,288 85	4,029 02	-----------	259 83
-----------	-----------	29,478 32	29,120 96	-----------	357 63
-----------	-----------	2,801 80	2,807 13	5 33	-----------
-----------	-----------	13,408 76	12,292 44	-----------	1,116 32
-----------	-----------	5,869 41	5,428 43	-----------	440 98
-----------	-----------	1,179 15	1,172 48	-----------	6 67
-----------	-----------	29,739 71	27,902 25	-----------	1,837 46
-----------	-----------	19,612 40	15,835 40	-----------	3,777 00
-----------	-----------	6,211 19	5,439 75	-----------	771 44
-----------	-----------	7,661 98	7,539 86	-----------	122 12
-----------	-----------	837 41	756 38	-----------	81 03
-----------	-----------	14,086 33	14,053 12	-----------	33 21
-----------	-----------	5,348 64	5,075 45	-----------	273 19
-----------	-----------	5,423 52	5,295 34	-----------	128 18
-----------	-----------	12,930 38	11,428 50	-----------	1,501 88
-----------	-----------	3,875 62	3,628 40	-----------	247 22
-----------	-----------	7,820 12	7,311 21	-----------	508 91
-----------	-----------	20,459 95	19,384 56	-----------	1,075 39
-----------	-----------	12,457 95	10,844 84	-----------	1,613 11
-----------	-----------	11,969 88	10,937 74	-----------	1,032 14
-----------	-----------	11,521 77	9,745 43	-----------	1,776 34
-----------	-----------	10,191 70	9,078 08	-----------	1,113 62
-----------	-----------	1,978 06	1,896 81	-----------	81 25
-----------	-----------	12,238 68	11,181 05	-----------	1,057 63
-----------	-----------	2,025 29	2,193 29	168 00	-----------
-----------	-----------	6,010 64	5,814 32	-----------	196 32
-----------	-----------	1,559 58	1,405 16	-----------	154 42
-----------	-----------	7,837 02	7,432 37	-----------	404 65
-----------	-----------	3,508 70	2,862 46	-----------	646 24
-----------	-----------	3,653 65	3,516 15	-----------	137 50
-----------	-----------	1,821 74	1,600 44	-----------	221 30
-----------	-----------	4,443 33	4,307 60	-----------	135 73
-----------	-----------	24,581 28	23,635 80	-----------	945 48
-----------	-----------	30,542 24	29,714 50	-----------	827 74
-----------	-----------	8,616 38	8,101 22	-----------	515 16
-----------	-----------	7,907 86	7,081 76	-----------	826 10
-----------	-----------	5,015 23	4,598 66	-----------	416 57
-----------	-----------	11,070 33	10,723 64	-----------	346 69
-----------	-----------	9,314 38	8,467 16	-----------	847 22
-----------	-----------	6,695 58	6,470 60	-----------	224 98
-----------	-----------	13,025 80	12,060 45	-----------	965 35
-----------	-----------	25,882 60	24,225 57	-----------	1,657 03
-----------	-----------	9,973 43	9,186 07	-----------	787 36
-----------	-----------	6,445 03	6,013 88	-----------	431 15
-----------	-----------	7,108 63	6,081 63	-----------	1,027 00
-----------	-----------	3,944 70	3,929 44	-----------	15 26
-----------	-----------	2,270 10	2,244 44	-----------	25 66
-----------	-----------	23,390 56	21,373 72	-----------	2,016 84
-----------	-----------	$1,532,050 94	$1,416,078 70	$1,231 02	$117,203 26

No. 4—Continued.

COUNTIES.	White males over 21 years of age, 1877.	White males over 21 years of age, 1878.	Increase.	Decrease.	Legal voters, white, 1877.
Adair	2,249	2,287	38	----------	2,249
Allen	2,175	2,338	163	----------	2.224
Anderson	1,669	1,644	----------	25	1,693
Ballard	2,629	2,612	----------	17	3,600
Barren	3,540	3,648	108	----------	3,540
Bath	2,133	2,166	33	----------	2,133
Bell	944	884	----------	60	944
Boone	2,679	2,649	----------	30	2,660
Bourbon	2,054	2,178	124	----------	2,054
Boyd	2,235	2,246	11	----------	2,261
Boyle	1,658	1,705	47	----------	1,658
Bracken	2,826	2 734	----------	92	2,811
Breathitt	1,117	1,172	55	----------	1,177
Breckinridge	2,997	3,099	102	----------	3,001
Bullitt	1,498	1,628	130	----------	1,486
Butler	1,974	2,017	43	----------	1,985
Caldwell	1,952	1,986	34	----------	1,221
Calloway	2,248	2,334	86	----------	2,304
Campbell	7,220	6,930	----------	290	7,220
Carroll	1,708	1,760	52	----------	1,708
Carter	2,024	2,110	86	----------	2,084
Casey	1,803	1,859	56	----------	1,803
Christian	3,611	3,769	158	----------	3,611
Clark	1,854	1,999	145	----------	1,854
Clay	1,758	1,776	18	----------	1,837
Clinton	1,148	1,151	3	----------	1,207
Crittenden	2,055	2,068	13	----------	2,058
Cumberland	1,290	1,337	47	----------	1,330
Daviess	4,880	4,843	----------	37	4,880
Edmonson	1,197	1,225	28	----------	1,217
Estill	1,650	1,609	----------	41	1,653
Elliott	1,018	1,077	59	----------	1,086
Fayette	4,696	4.381	----------	315	4,696
Fleming	2,821	2,887	66	----------	2,874
Floyd	1,554	1,608	54	----------	1,645
Franklin	2,593	2,654	61	----------	2,582
Fulton	1,335	1,372	37	----------	1,112
Gallatin	1,037	1,025	----------	2	1,037
Garrard	2,002	1,680	----------	322	1,957
Grant	2,490	2,660	170	----------	2,489
Graves	4,189	5,283	1,094	----------	4,190
Grayson	2,770	2,856	86	----------	2,783
Green	1,827	1,840	13	----------	1,834
Grenup	2,445	2,427	----------	18	2,462
Hancock	1,431	1,421	----------	10	1,431
Hardin	3,270	3,491	221	----------	3,283
Harlan	914	888	----------	26	918
Harrison	2,893	3,018	125	----------	2,890
Hart	2,908	2,981	73	----------	2,902
Henderson	3,529	3,598	69	----------	3,509
Henry	2,487	2,808	321	----------	2,482
Hickman	1,795	1,902	107	----------	1,758
Hopkins	3,278	3,345	67	----------	3,351
Jackson	970	1,058	88	----------	1,027
Jefferson	44,705	48,793	4,088	----------	42,832
Jessamine	1,606	1,639	33	----------	1,603
Johnson	1,428	1,503	75	----------	1,502
Kenton	10,594	9,998	----------	596	10,332
Knox	1,583	1,662	79	----------	1,659
Larue	1,755	1,742	----------	13	1,765

No. 4—Continued.

Legal voters, white, 1878.	Increase.	Decrease.	Enrolled militia, 1877.	Enrolled militia, 1878.	Increase.	Decrease.
2,287	38					
2,234	10					
1,660		33				
2,589		1,011				
3,648	108					
2,166	33					
931		13				
2,620		40				
2,178	124					
2,313	52					
1,705	47					
2,717		94				
1,233	56					
3,108	107					
1,623	137					
2,018	33					
1,216		5				
2,402	98					
6,930		290				
1,758	50					
2,221	137					
1,859	56					
3,805	194					
1,997	143					
1,880	43					
1,206		1				
2,085	27					
1,395	65					
4,843		37				
1,261	44					
1,635		18				
1,164	78					
4,370		326				
2,970	96					
1,687	42					
2,634	52					
1,124	12					
1,035		2				
1,680		277				
2,659	170					
5,282	1,092					
2,854	71					
1,853	19					
2,470	8					
1,421		10				
3,496	213					
906		12				
3,019	129					
2,977	75					
3,542	33					
2,807	325					
1,862	104					
3,436	85					
1,149	122					
41,803		1,029				
1,639	36					
1,590	88					
9,636		696				
1,750	91					
1,763		2				

No. 4—Continued.

COUNTIES.	White males over 21 years of age, 1877.	White males over 21 years of age, 1878.	Increase.	Decrease.	Legal voters, white, 1877.
Laurel	1,350	1,378	28		1,410
Lawrence	2,068	2,156	88		2,149
Lee	724	739	15		744
Letcher	963	1,028	65		987
Lewis	2,644	2,772	128		2,627
Lincoln	2,387	2,499	112		2,387
Livingston	1,619	1,686	67		1,668
Logan	3,593	3,387		206	3,595
Lyon	1,160	1,182	22		1,160
Madison	3,423	3,438	15		3,468
Magoffin	937	939	2		937
Marion	2,306	2,316	10		2,306
Marshall	1,760	1,809	49		1,850
Martin	473	528	55		484
Mason	3,500	3,540	40		3,509
McCracken	2,707	2,707			2,599
McLean	1,601	1,593		8	1,601
Meade	1,761	1,813	52		1,763
Menifee	584	648	64		584
Mercer	2,121	2,332	211		2,121
Metcalfe	1,750	1,804	54		1,763
Monroe	1,927	1,978	51		1,944
Montgomery	1,539	1,652	113		1,539
Morgan	1,452	1,520	68		1,547
Muhlenburg	2,620	2,830	210		2,611
Nelson	2,504	2,602	98		2,560
Nicholas	2,006	2,000		6	2,006
Ohio	3,504	3,537	33		3,569
Oldham	1,274	1,289	15		1,274
Owen	3,137	3,164	27		3,137
Owsley	812	827	15		832
Pendleton	3,375	3,403	28		3,371
Perry	1,043	1,088	45		1,076
Pike	1,905	1,978	73		1,988
Powell	575	612	37		574
Pulaski	3,412	3,595	183		3,516
Robertson	1,179	1,165		14	1,179
Rockcastle	1,541	1,568	27		1,631
Rowan	691	751	60		694
Russell	1,358	1,422	64		1,378
Scott	2,137	2,239	102		2,160
Shelby	2,576	2,626	50		2,576
Simpson	1,832	1,819		13	1.828
Spencer	1,164	1,194	30		1,166
Taylor	1,553	1,559	6		1,553
Todd	2,034	2,030		4	2,019
Trigg	2,134	2,071		63	2,154
Trimble	1,485	1,532	47		1,478
Union	3,092	3,310	218		3,065
Warren	4,009	4,115	106		4,040
Washington	2,404	2,377		27	2,404
Wayne	1,976	1,909		67	1,920
Webster	2,355	2,256		99	2,362
Whitley	1,833	1,840	7		1,957
Wolfe	810	871	61		828
Woodford	1,467	1,550	83		1,466
Total	294,844	303,943	11,500	2,401	294,508

No. 4—Continued.

Legal voters, white, 1878.	Increase.	Decrease.	Enrolled militia, 1877	Enrolled militia, 1878.	Increase.	Decrease.
1,485	75					
2,216	67					
761	17					
1,054	67					
2,718	91					
2,499	112					
1,740	72					
3,440		155				
1,171	11					
3,441		27				
939	2					
2,316	10					
1,885	35					
556	72					
3,547	38					
2,598		1				
1,593		8				
1,813	50					
649	65					
2,332	211					
1,820	57					
2,005	61					
1,654	115					
1,645	98					
2,803	192					
2,561	61					
2,000		6				
3,653	84					
1,289	15					
3,166	29					
852	20					
3,415	44					
1,130	54					
2,112	124					
619	45					
3,699	183					
1,165		14				
1,690	59					
760	66					
1,422	44					
2,247	87					
2,631	55					
1,803		25				
1,194	28					
1,559	6					
2,023	4					
2,128		26				
1,518	40					
3,256	191					
4,180	140					
2,377		27				
2,011	91					
2,286		76				
1,970	13					
884	56					
1,541	75					
297,922	7,675	4,261				

No. 4—Continued.

COUNTIES.	Children between 6 & 20 years old, '77.	Children between 6 & 20 years old, '78.	Increase.	Decrease.	Hogs over six months old, 1877.
Adair	3,511	3.659	148	----------	7,154
Allen	3,488	3,536	48	----------	7,273
Anderson	2,540	2,439	----------	101	4,479
Ballard	3,855	3,877	22	----------	9,613
Barren	4,787	4,756	----------	31	8,383
Bath	3,015	3,039	24	----------	7,818
Bell	1,746	1,784	38	----------	2,868
Boone	2,951	2,927	----------	24	9,798
Bourbon	1,981	1,821	----------	160	7,712
Boyd	3,601	3,523	----------	78	3,279
Boyle	1,751	1,779	28	----------	4,626
Bracken	4,040	3,925	----------	115	5,968
Breathitt	2,364	2,444	80	----------	6,042
Breckinridge	4,393	4,570	177	----------	12,134
Bullitt	1,879	1,954	75	----------	5,224
Butler	3,283	3,312	29	----------	8,681
Caldwell	2,859	3,028	169	----------	5,436
Calloway	3,805	3,913	108	----------	8,769
Campbell	10,167	10,412	245	----------	1,647
Carroll	2,027	2,106	79	----------	2,532
Carter	3.507	3,363	----------	144	5,517
Casey	3,142	3,257	115	----------	8,184
Christian	4,069	4,573	504	----------	8,321
Clark	2,296	2,372	76	----------	7,763
Clay	3,319	3,428	109	----------	8,964
Clinton	2,126	2,158	32	----------	4,747
Crittenden	3,334	3,387	53	----------	9,269
Cumberland	1,948	2,011	63	----------	4,961
Daviess	6,505	5,981	----------	524	9,528
Edmonson	1,928	2,022	94	----------	4,068
Estill	2,717	2,764	47	----------	5,025
Elliott	2,105	2,221	116	----------	4,762
Fayette	3.097	2,908	----------	189	6,087
Fleming	4,429	4,434	5	----------	7,218
Floyd	3,316	3,360	44	----------	9,569
Franklin	3,625	3,567	----------	58	4,635
Fulton	1,857	1,909	52	----------	2,694
Gallatin	1,278	1,304	26	----------	2,442
Garrard	2,383	2,178	----------	205	9,485
Grant	4,315	3,341	----------	974	6,480
Graves	6,586	6,332	----------	254	13,650
Grayson	4,404	4,571	167	----------	9,292
Green	2,788	1,869	----------	919	5,711
Greenup	3,630	3,536	----------	94	4,884
Hancock	2,012	2,091	79	----------	2,780
Hardin	4,549	4,634	85	----------	10,211
Harlan	875	1,739	864	----------	5,624
Harrison	4,130	4,305	175	----------	9,012
Hart	4,501	4,633	132	----------	7,436
Henderson	4,422	4,769	347	----------	6,401
Henry	2,139	3,049	910	----------	5,301
Hickman	2,890	3,060	170	----------	5,459
Hopkins	5,178	5,290	112	----------	9,141
Jackson	1,878	2,008	130	----------	3,602
Jefferson	44,328	41,238	----------	3,090	4,100
Jessamine	1,809	1,883	74	----------	2,030
Johnson	1,746	2,784	1,038	----------	7,036
Kenton	12,686	13,438	752	----------	4,783
Knox	3,092	3,204	112	----------	4,749
Larue	2,349	2,502	153	----------	5,736

No. 4—Continued.

Hogs over six months old, 1878.	Increase.	Decrease.	Studs, jacks, and bulls, 1877.	Studs, jacks, and bulls, 1878.	Increase.	Decrease.
8,565	1,401	----------	33	30	----------	3
7.705	432	----------	31	27	----------	4
5,298	819	----------	6	15	9	----------
11,428	1,815	----------	22	26	4	----------
8,468	85	----------	41	45	4	----------
7,156	----------	662	13	11	----------	2
4,880	2,012	----------	3	3	----------	----------
8,733	----------	1,065	4	6	2	----------
3,889	----------	3,823	68	63	----------	5
2,870	----------	409	5	4	----------	1
3,681	----------	945	16	3	----------	13
4,635	----------	1,333	28	30	2	----------
6,894	852	----------	3	4	1	----------
12,774	640	----------	21	31	10	----------
5.842	618	----------	16	17	1	----------
9,170	489	----------	16	16	----------	----------
5,713	277	----------	7	9	2	----------
11,037	2,268	----------	19	23	4	----------
2,275	628	----------	11	11	----------	----------
3,695	1,163	----------	5	14	9	----------
4.353	----------	1,164	9	35	26	----------
8,298	114	----------	28	22	----------	6
9,881	1,560	----------	16	25	9	----------
7,371	----------	392	36	43	7	----------
10,441	1,477	----------	19	7	----------	12
6,155	1,408	----------	16	10	----------	6
10,743	1,474	----------	15	16	1	----------
6,731	1,770	----------	6	5	----------	1
9,783	255	----------	31	18	----------	13
5,684	1,616	----------	11	9	----------	2
5,600	575	----------	18	27	9	----------
4,251	----------	511	5	7	2	----------
6,012	----------	75	16	3	----------	13
4,115	----------	3,103	1	----------	----------	1
13,685	4.116	----------	5	3	----------	2
4,943	308	----------	17	31	14	----------
3,193	499	----------	3	11	8	----------
1,955	----------	487	2	1	----------	1
7,476	----------	2,009	32	31	----------	1
5,022	----------	1,458	19	16	----------	3
14,571	921	----------	32	30	----------	2
9,970	678	----------	22	29	7	----------
5,753	42	----------	16	12	----------	4
5,098	214	----------	4	3	----------	1
3,612	832	----------	6	8	2	----------
14,435	4,224	----------	20	13	----------	7
8,081	2,457	----------	1	----------	----------	1
7,953	----------	1,059	93	87	----------	6
11,081	3,645	----------	16	12	----------	4
7,082	681	----------	13	25	12	----------
7,327	2.026	----------	8	23	15	----------
6,171	712	----------	14	21	7	----------
14,782	5,641	----------	18	13	----------	5
3,683	81	----------	6	1	----------	5
1,955	----------	2,145	----------	2	2	----------
1,625	----------	405	38	29	----------	9
8,382	1,346	----------	6	3	----------	3
4,418	----------	365	6	6	----------	----------
6,063	1,314	----------	5	13	8	----------
7,059	1,323	----------	17	11	----------	6

No. 4—Continued.

COUNTIES	Children between 6 & 20 years old, '77.	Children between 6 & 20 years old, '78.	Increase.	Decrease.	Hogs over six months old, 1877.
Laurel	2,508	2,678	170	----------	4,202
Lawrence	4,008	4,198	190	----------	9,063
Lee	1,315	1,356	41	----------	1,749
Letcher	1,936	2,028	92	----------	6,523
Lewis	3,992	4,189	197	----------	3,914
Lincoln	2,938	3,156	218	----------	3,304
Livingston	2,475	2,648	173	----------	6,944
Logan	5,055	5,107	52	----------	9,848
Lyon	1,868	1,906	38	----------	2,952
Madison	3,557	4,399	842	----------	12,770
Magoffin	1,885	1,925	40	----------	6,711
Marion	2,957	2,912	----------	45	5,512
Marshall	3,284	3,318	34	----------	8,180
Martin	483	1,000	517	----------	1,989
Mason	4,178	4,044	----------	134	11,725
McCracken	3,283	3,365	82	----------	4,097
McLean	2,319	2,306	----------	13	5,048
Meade	2,604	2,718	114	----------	2,690
Menifee	935	1,038	103	----------	857
Mercer	2,286	2,648	362	----------	3,668
Metcalfe	2,493	2,569	76	----------	5,491
Monroe	3,313	3,349	36	----------	7,955
Montgomery	1,804	1,779	----------	25	2,961
Morgan	2,694	2,755	61	----------	6,378
Muhlenburg	3,927	3,056	----------	871	6,043
Nelson	3,392	3,576	184	----------	8,687
Nicholas	2,712	2,685	----------	27	12,192
Ohio	5,402	5,453	51	----------	11,940
Oldham	1,398	1,502	104	----------	3,389
Owen	4,445	4,491	46	----------	7,742
Owsley	1,492	1,500	8	----------	3,297
Pendleton	4,995	5,015	20	----------	9,611
Perry	2,056	2,129	73	----------	6,810
Pike	3,743	3,959	216	----------	10,632
Powell	1,080	1,043	----------	37	1,822
Pulaski	6,050	6,355	305	----------	10,452
Robertson	1,864	1,837	----------	27	2,835
Rockcastle	2,775	2,826	51	----------	4,253
Rowan	1,155	1,277	122	----------	1,955
Russell	2,239	2,325	86	----------	6,229
Scott	2,680	2,756	76	----------	6,621
Shelby	2,429	2,307	----------	122	11,963
Simpson	2,526	2,389	----------	137	6,915
Spencer	1,577	1,595	18	----------	3,453
Taylor	2,429	2,427	----------	2	4,389
Todd	2,408	2,440	32	----------	7,213
Trigg	3,093	3,197	104	----------	4,983
Trimble	1,821	1,859	38	----------	3,362
Union	4,154	4,319	165	----------	9,576
Warren	6,245	6,184	----------	61	11,962
Washington	3,557	3,474	----------	83	2,703
Wayne	3,421	3,454	33	----------	9,438
Webster	3,441	3,550	109	----------	6,830
Whitley	3,686	3,641	----------	45	5,646
Wolfe	1,630	1,724	94	----------	1,768
Woodford	1,650	1,706	56	----------	2,350
Total	404,973	409,719	13,335	8,589	727,685

No. 4—Continued.

Hogs over six months old, 1878.	Increase.	Decrease.	Studs, jacks, and bulls, 1877.	Studs, jacks, and bulls, 1878.	Increase.	Decrease.
5,281	1,079	----------	13	10	----------	3
10,320	1,257	----------	8	4	----------	4
2,244	495	----------	----------	----------	----------	----------
10,357	3,834	----------	4	2	----------	2
4,145	231	----------	12	6	----------	6
4,718	1,414	----------	----------	5	5	----------
8,753	1,809	----------	20	16	----------	4
7,982	----------	1,866	26	22	----------	4
3,608	656	----------	15	15	----------	----------
12,468	----------	302	46	44	----------	2
6,579	----------	132	4	5	1	----------
6,013	501	----------	26	24	----------	2
11,036	2,856	----------	6	15	9	----------
3,336	1,347	----------	8	1	----------	7
9,645	----------	2,080	33	31	----------	2
4,095	----------	2	12	10	----------	2
8,230	3,182	----------	6	2	----------	4
4,646	1,956	----------	21	15	----------	6
848	----------	9	4	4	----------	----------
4,355	687	----------	12	24	12	----------
7,053	1,562	----------	19	16	----------	3
8,608	653	----------	35	22	----------	13
5,520	2,559	----------	61	46	----------	15
5,991	----------	387	17	16	----------	1
6,888	845	----------	27	21	----------	6
8,445	----------	242	38	28	----------	10
10,657	----------	1,535	25	16	----------	9
16,082	4,142	----------	22	25	3	----------
3,731	342	----------	15	14	----------	1
7,025	----------	717	24	31	7	----------
3,941	644	----------	7	4	----------	3
7,826	----------	1,785	25	23	----------	2
9,765	2,955	----------	4	5	1	----------
16,327	5,695	----------	3	1	----------	2
1,885	63	----------	3	8	5	----------
12,784	2,332	----------	24	23	----------	1
1,492	----------	1,343	23	18	----------	5
5,328	1,075	----------	5	13	8	----------
2,345	390	----------	6	11	5	----------
8,153	1,924	----------	9	2	----------	7
6,285	----------	336	14	10	----------	4
11,720	----------	243	13	12	----------	1
6,037	----------	878	29	9	----------	20
4,372	919	----------	2	6	4	----------
5,392	1,003	----------	25	19	----------	6
6,137	----------	1,076	13	17	4	----------
6,716	1,733	----------	19	24	5	----------
4,478	1,116	----------	18	4	----------	14
12,070	2,494	----------	23	30	7	----------
15,695	3,733	----------	38	50	12	----------
4,997	2,294	----------	14	3	----------	11
7,878	----------	1,560	22	4	----------	18
8,043	1,213	----------	11	26	15	----------
5,755	109	----------	5	8	3	----------
1,939	171	----------	13	14	1	----------
2,529	179	----------	38	24	----------	14
808,039	116,257	35,903	1,979	1,907	284	356

No. 4—Continued.

COUNTIES.	Rates per season, 1877.	Rates per season, 1878.	Increase.	Decrease.	Tavern licenses, 1877.
Adair	$111	$124	$13	----	----
Allen	132	125	----	$7	----
Anderson	26	35	9	----	----
Ballard	161	165	4	----	3
Barren	207	221	14	----	----
Bath	90	62	----	28	1
Bell	16	11	----	5	1
Boone	20	25	5	----	3
Bourbon	1,206	338	----	868	4
Boyd	14	10	----	4	----
Boyle	204	21	----	183	----
Bracken	180	177	----	3	3
Breathitt	7	14	7	----	----
Breckinridge	132	176	44	----	7
Bullitt	96	108	12	----	1
Butler	90	80	----	10	1
Caldwell	57	47	----	10	----
Calloway	----	16	16	----	1
Campbell	56	42	----	14	10
Carroll	----	50	50	----	6
Carter	42	38	----	4	----
Casey	92	112	20	----	1
Christian	128	197	69	----	----
Clark	638	271	----	367	2
Clay	56	29	----	27	----
Clinton	76	43	----	33	----
Crittenden	90	94	4	----	3
Cumberland	27	27	----	----	----
Daviess	219	116	----	103	3
Edmonson	48	48	----	----	----
Estill	83	104	21	----	3
Elliott	22	18	----	4	3
Fayette	488	45	----	443	----
Fleming	5	----	----	5	3
Floyd	25	14	----	11	----
Franklin	103	104	1	----	----
Fulton	19	87	68	----	1
Gallatin	10	8	----	2	6
Garrard	216	183	----	33	1
Grant	91	57	----	34	----
Graves	163	170	7	----	2
Grayson	109	48	----	61	7
Green	90	66	----	24	----
Greenup	38	15	----	23	----
Hancock	23	44	21	----	----
Hardin	112	73	----	39	----
Harlan	3	----	----	3	1
Harrison	626	491	----	135	6
Hart	96	75	----	21	----
Henderson	140	83	----	57	2
Henry	56	136	80	----	1
Hickman	88	136	48	----	5
Hopkins	87	71	----	16	2
Jackson	23	----	----	23	----
Jefferson	----	----	----	----	2
Jessamine	215	217	2	----	2
Johnson	25	11	----	14	1
Kenton	41	52	11	----	15
Knox	24	95	71	----	1
Larue	101	56	----	45	1

No. 4—Continued.

Tavern licenses, 1878.	Increase.	Decrease.	White persons that are blind, 1877.	White persons that are blind, 1878.	Increase.	Decrease.
-----	-----	-----	3	8	5	-----
-----	-----	-----	2	4	2	-----
-----	-----	-----	1	1	-----	-----
2	-----	1	1	1	-----	-----
-----	-----	-----	3	6	3	-----
1	-----	-----	1	-----	-----	1
2	1	-----	1	1	-----	-----
1	-----	2	1	2	1	-----
3	-----	1	2	3	1	-----
-----	-----	-----	5	8	3	-----
-----	-----	-----	1	1	-----	-----
5	2	-----	5	9	4	-----
-----	-----	-----	2	1	-----	1
3	-----	4	10	2	-----	8
2	1	-----	2	2	-----	-----
-----	-----	1	6	6	-----	-----
-----	-----	-----	2	-----	-----	2
-----	-----	1	8	10	2	-----
11	1	-----	2	-----	-----	2
12	6	-----	4	9	5	-----
-----	-----	-----	4	4	-----	-----
1	-----	-----	-----	-----	-----	-----
2	2	-----	4	3	-----	1
3	1	-----	6	13	7	-----
-----	-----	-----	3	2	-----	1
-----	-----	-----	6	4	-----	2
2	-----	1	6	4	-----	2
-----	-----	-----	-----	-----	-----	-----
1	-----	2	5	5	-----	-----
1	1	-----	-----	1	1	-----
2	-----	1	5	5	-----	-----
-----	-----	3	-----	1	1	-----
-----	-----	-----	2	-----	-----	2
-----	-----	3	6	8	2	-----
-----	-----	-----	9	8	-----	1
-----	-----	-----	6	4	-----	2
1	-----	-----	1	3	2	-----
6	-----	-----	2	1	-----	1
-----	-----	1	2	-----	-----	2
4	4	-----	2	1	-----	1
-----	-----	2	7	4	-----	3
8	1	-----	9	5	-----	4
-----	-----	-----	7	-----	-----	7
-----	-----	-----	2	-----	-----	2
-----	-----	-----	2	2	-----	-----
2	2	-----	3	3	-----	-----
2	1	-----	2	4	2	-----
6	-----	-----	12	3	-----	9
-----	-----	-----	4	4	-----	-----
-----	-----	2	3	1	-----	2
2	1	-----	2	2	-----	-----
4	-----	1	-----	1	1	-----
-----	-----	2	3	2	-----	1
-----	-----	-----	-----	-----	-----	-----
2	-----	-----	4	2	-----	2
1	-----	1	5	3	-----	2
-----	-----	1	4	2	-----	2
23	8	-----	-----	2	2	-----
1	-----	-----	4	11	7	-----
3	2	-----	-----	2	2	-----

No. 4—Continued.

COUNTIES.	Rates per season, 1877.	Rates per season, 1878.	Increase.	Decrease.	Tavern licenses, 1877.
Laurel	$49	$24	----	$25	3
Lawrence	31	23	----	8	----
Lee	----	----	----	----	7
Letcher	9	8	----	1	1
Lewis	48	30	----	18	5
Lincoln	----	19	$19	----	----
Livingston	122	97	----	25	----
Logan	155	136	----	19	1
Lyon	34	56	22	----	----
Madison	455	325	----	130	----
Magoffin	62	22	----	40	----
Marion	120	169	49	----	----
Marshall	45	82	37	----	1
Martin	3	3	----	----	2
Mason	272	178	----	94	----
McCracken	95	43	----	52	3
McLean	34	13	----	21	8
Meade	72	83	11	----	----
Menifee	16	22	6	----	1
Mercer	20	100	80	----	----
Metcalfe	116	109	----	7	----
Monroe	158	75	----	83	----
Montgomery	5	5	----	----	----
Morgan	19	5	----	14	----
Muhlenburg	130	108	----	22	----
Nelson	261	191	----	70	3
Nicholas	175	104	----	71	1
Ohio	123	139	16	----	1
Oldham	103	106	3	----	7
Owen	147	112	----	35	2
Owsley	17	8	----	9	----
Pendleton	143	149	6	----	4
Perry	15	13	----	2	----
Pike	13	2	----	11	1
Powell	22	42	20	----	----
Pulaski	80	93	13	----	----
Robertson	132	99	----	33	1
Rockcastle	24	59	35	----	----
Rowan	22	43	21	----	----
Russell	38	8	----	30	----
Scott	220	207	----	13	5
Shelby	99	75	----	24	6
Simpson	202	38	----	164	----
Spencer	12	44	32	----	----
Taylor	127	92	----	35	----
Todd	111	133	22	----	8
Trigg	95	158	63	----	2
Trimble	103	24	----	79	2
Union	166	161	----	5	6
Warren	224	281	57	----	14
Washington	93	15	----	78	----
Wayne	82	11	----	71	----
Webster	43	70	27	----	14
Whitley	22	28	6	----	1
Wolfe	51	37	----	14	1
Woodford	536	319	----	217	4
Total	$12,914	$9,877	$1,142	$4,179	230

No. 4—Continued.

Tavern licenses, 1878.	Increase.	Decrease.	White persons that are blind, 1877.	White persons that are blind, 1878.	Increase.	Decrease.
----------	----------	3	4	6	2	----------
----------	----------	----------	----------	4	4	----------
6	----------	1	3	2	----------	1
----------	----------	1	4	2	----------	2
3	----------	2	6	5	----------	1
5	5	----------	4	3	----------	1
----------	----------	----------	1	----------	----------	1
----------	----------	1	4	8	4	----------
----------	----------	----------	2	2	----------	----------
----------	----------	----------	1	1	----------	----------
----------	----------	----------	5	3	----------	2
----------	----------	----------	3	1	----------	2
----------	----------	1	3	5	2	----------
1	----------	1	----------	----------	----------	----------
2	2	----------	----------	----------	----------	----------
2	----------	1	1	4	3	----------
7	----------	1	----------	----------	----------	----------
2	2	----------	----------	2	2	----------
----------	----------	1	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------	----------
----------	----------	----------	2	3	1	----------
----------	----------	----------	12	8	----------	4
----------	----------	----------	3	1	----------	2
----------	----------	----------	3	2	----------	1
7	7	----------	5	3	----------	2
2	----------	1	----------	1	1	----------
----------	----------	1	----------	----------	----------	----------
1	----------	----------	8	8	----------	----------
8	1	----------	2	2	----------	----------
----------	----------	2	2	1	----------	1
----------	----------	----------	3	3	----------	----------
10	6	----------	1	5	4	----------
----------	----------	----------	1	3	2	----------
----------	----------	1	2	2	----------	----------
----------	----------	----------	----------	----------	----------	----------
----------	----------	----------	7	6	----------	1
3	2	----------	5	5	----------	----------
----------	----------	----------	5	6	1	----------
2	2	----------	3	1	----------	2
----------	----------	----------	2	1	----------	1
8	3	----------	----------	----------	----------	----------
6	----------	----------	1	----------	----------	1
----------	----------	----------	4	2	----------	2
----------	----------	----------	1	----------	----------	1
----------	----------	----------	----------	1	1	----------
8	----------	----------	----------	----------	----------	----------
5	3	----------	6	7	1	----------
2	----------	----------	2	2	----------	----------
----------	----------	6	5	2	----------	3
10	----------	4	3	3	----------	----------
----------	----------	----------	4	3	----------	1
----------	----------	----------	4	1	----------	3
----------	----------	14	1	4	3	----------
----------	----------	1	1	1	----------	----------
----------	----------	1	1	2	1	----------
1	----------	3	----------	----------	----------	----------
220	67	77	344	331	85	98

No. 4—Continued.

COUNTIES.	White persons that are deaf & dumb, 1877.	White persons that are deaf & dumb, 1878.	Increase.	Decrease.	Number of dogs over 2, 1877.
Adair	15	7		8	
Allen	8	6		2	
Anderson	1	1			
Ballard	6	7	1		18
Barren	7	3		4	10
Bath	2	1		1	
Bell					3
Boone	10	2		8	47
Bourbon					
Boyd	7	7			5
Boyle	1	1			
Bracken	13	2		11	13
Breatbitt	2	4	2		1
Breckinridge		4	4		2
Bullitt					6
Butler	4	1		3	1
Caldwell	4			4	9
Calloway	6	9	3		
Campbell					1
Carroll	3	2		1	
Carter					5
Casey					7
Christian	2	3	1		10
Clark	6	7	1		86
Clay	3	5	2		10
Clinton	2	3	1		
Crittenden	4			4	42
Cumberland		1	1		
Daviess	3	1		2	3
Edmonson	4	1		3	
Estill	3	2		1	
Elliott	6	2		4	
Fayette	1	4	3		75
Fleming	5	7	2		1
Floyd	4	2		2	6
Franklin	6	6			15
Fulton					2
Gallatin					
Garrard	4	5	1		
Grant	6	5		1	23
Graves	5	7	2		7
Grayson	7	1		6	7
Green					1
Greenup					1
Hancock	1			1	7
Hardin	3			3	
Harlan	6	3		3	
Harrison	11	10		1	9
Hart	7	6		1	
Henderson	3	3			75
Henry	3	1		2	86
Hickman	1	1			5
Hopkins	3			3	13
Jackson					
Jefferson	5	14	9		125
Jessamine	2	2			12
Johnson	1	3	2		
Kenton	13	10		3	70
Knox	16	15		1	3
Larue	6	6			

No. 4—Continued.

Number of dogs over 2, 1878.	Increase.	Decrease.	Number of sheep killed by dogs, 1877.	Number of sheep killed by dogs, 1878.	Increase.	Decrease.
9	9	--------	114	64	--------	50
--------	--------	--------	141	127	--------	14
--------	--------	--------	46	17	--------	29
8	--------	10	180	178	--------	2
5	--------	5	66	137	71	--------
--------	--------	--------	4	47	43	--------
1	--------	2	24	--------	--------	24
25	--------	22	85	112	27	--------
--------	--------	--------	426	187	--------	239
7	2	--------	122	64	--------	58
--------	--------	--------	53	153	100	--------
--------	--------	13	61	44	--------	17
--------	--------	1	75	27	--------	48
4	2	--------	139	68	--------	71
19	13	--------	77	35	--------	42
1	--------	--------	114	125	11	--------
5	--------	4	77	29	--------	48
6	6	--------	166	167	1	--------
--------	--------	1	29	29	--------	--------
--------	--------	--------	--------	--------	--------	--------
11	6	--------	52	41	--------	11
8	1	--------	101	81	--------	20
20	10	--------	129	178	49	--------
2	--------	84	190	89	--------	101
8	--------	2	42	53	11	--------
--------	--------	--------	31	11	--------	20
8	--------	34	368	333	--------	35
--------	--------	--------	31	--------	--------	31
4	1	--------	157	181	24	--------
--------	--------	--------	93	45	--------	48
--------	--------	--------	14	24	10	--------
--------	--------	--------	141	29	--------	112
--------	--------	75	59	36	--------	23
6	5	--------	119	3	--------	116
4	--------	2	73	40	--------	33
23	8	--------	216	56	--------	160
4	2	--------	10	21	11	--------
--------	--------	--------	--------	--------	--------	--------
58	58	--------	362	228	--------	134
--------	--------	23	91	15	--------	76
--------	--------	7	296	94	--------	202
5	--------	2	108	75	--------	33
--------	--------	1	72	72	--------	--------
1	--------	--------	65	115	50	--------
2	--------	5	39	41	2	--------
--------	--------	--------	96	52	--------	44
--------	--------	--------	1	--------	--------	1
15	6	--------	124	56	--------	68
--------	--------	--------	81	55	--------	26
18	--------	57	158	114	--------	44
1	--------	85	205	37	--------	168
1	--------	4	55	48	--------	7
--------	--------	13	97	7	--------	90
--------	--------	--------	13	17	4	--------
45	--------	80	--------	24	24	--------
6	--------	6	150	107	--------	43
--------	--------	--------	33	26	--------	7
11	--------	59	120	90	--------	30
3	--------	--------	130	21	--------	99
--------	--------	--------	27	20	--------	7

No. 4—Continued.

COUNTIES.	White persons that are deaf & dumb, 1877.	White persons that are deaf & dumb, 1878.	Increase.	Decrease.	Number of dogs over 2, 1877.
Laurel	4	5	1		10
Lawrence		1	1		
Lee	2	3	1		1
Letcher	2	5	3		1
Lewis	4	3		1	18
Lincoln	4	10	6		
Livingston	2	1		1	21
Logan	2			2	19
Lyon					4
Madison	6	7	1		
Magoffin	1			1	7
Marion	1	5	4		61
Marshall	2			2	
Martin					
Mason	1	1			52
McCracken	5	2		3	5
McLean					97
Meade	1	2	1		
Menifee					
Mercer					14
Metcalfe					2
Monroe	4	9	5		1
Montgomery	2			2	34
Morgan	7	5		2	8
Muhlenburg	5	6	1		
Nelson	1			1	50
Nicholas					6
Ohio	2	2			5
Oldham	1	3	2		
Owen	3	5	2		9
Owsley	2	1		1	
Pendleton	1			1	30
Perry	5	3		2	2
Pike	3	1		2	6
Powell	2	1		1	
Pulaski	11	3		8	3
Robertson	1			1	9
Rockcastle	4	2		2	1
Rowan		1	1		
Russell	4	4			
Scott					18
Shelby					69
Simpson		2	2		9
Spencer	2			2	
Taylor					2
Todd	1	3	2		
Trigg	1	1			13
Trimble					1
Union	2	1		1	65
Warren	4	6	2		20
Washington	3	4	1		35
Wayne	1			1	4
Webster		3	3		
Whitley	1			1	1
Wolfe					1
Woodford	2	1		1	35
Total	353	305	74	122	1,571

No. 4—Continued.

Number of dogs over 2, 1878.	Increase.	Decrease.	Number of sheep killed by dogs, 1877	Number of sheep killed by dogs, 1878.	Increase.	Decrease.
7	--------	3	134	80	--------	54
134	134	--------	102	85	--------	17
1	--------	--------	19	40	21	--------
1	--------	--------	24	22	--------	2
4	--------	14	191	48	--------	143
--------	--------	--------	46	22	--------	24
17	--------	4	272	160	--------	112
4	--------	15	219	132	--------	87
8	4	--------	129	56	--------	73
--------	--------	--------	50	52	2	--------
--------	--------	7	28	18	--------	10
--------	--------	61	23	--------	--------	23
2	2	--------	138	75	--------	63
--------	--------	--------	14	3	--------	11
--------	--------	52	89	13	--------	76
2	--------	3	185	78	--------	107
107	10	--------	201	84	--------	117
--------	--------	--------	24	152	128	--------
--------	--------	--------	15	11	--------	4
14	--------	--------	50	28	--------	22
3	1	--------	57	83	26	--------
1	--------	--------	71	103	32	--------
--------	--------	34	11	--------	--------	11
6	--------	2	92	83	--------	9
17	17	--------	365	127	--------	238
5	--------	45	105	140	35	--------
--------	--------	6	84	102	18	--------
2	--------	3	278	180	--------	98
--------	--------	--------	184	73	--------	111
113	104	--------	332	76	--------	256
--------	--------	--------	7	1	--------	6
25	--------	5	30	26	--------	4
1	--------	1	9	29	20	--------
5	--------	1	5	40	35	--------
--------	--------	--------	41	40	--------	1
7	4	--------	74	114	40	--------
1	--------	8	31	27	--------	4
--------	--------	1	70	76	6	--------
4	4	--------	--------	27	27	--------
1	1	--------	113	41	--------	72
12	--------	6	123	123	--------	--------
21	--------	48	109	52	--------	57
4	--------	5	128	64	--------	64
--------	--------	--------	38	48	10	--------
4	2	--------	88	52	--------	36
2	2	--------	12	48	36	--------
18	5	--------	92	196	104	--------
--------	--------	1	233	61	--------	172
--------	--------	65	299	71	--------	228
6	--------	14	284	102	--------	182
--------	--------	35	--------	31	31	--------
3	--------	1	23	27	4	--------
--------	--------	--------	6	22	16	--------
--------	--------	1	36	8	--------	28
1	--------	--------	58	20	--------	38
13	--------	22	19	78	59	--------
930	419	1,060	11,598	7,695	1,088	4,991

No. 4—Continued.

COUNTIES.	Value of sheep killed by dogs, '77	Value of sheep killed by dogs, '78	Increase.	Decrease.	Pounds of tobacco, 1877.	Pounds of tobacco, 1878.
Adair	$237	$133	--------	$104	1,066,785	1,829,375
Allen	303	232	--------	71	814,521	1,293,319
Anderson	191	38	--------	153	14,400	26,605
Ballard	409	408	--------	1	2,934,370	4,199,532
Barren	163	315	$152	--------	1,699.784	2,838,310
Bath	11	142	131	--------	31,460	17,474
Bell	38	--------	--------	38	12,294	8,481
Boone	370	488	118	--------	898,603	986,864
Bourbon	2,972	980	--------	1,992	4,130	500
Boyd	242	170	--------	72	27,963	34,299
Boyle	422	771	349	--------	--------	24,000
Bracken	330	211	--------	119	4,437,000	2,985,400
Breathitt	150	54	--------	96	21,339	9,573
Breckinridge	--------	169	169	--------	4,546,000	5,691,000
Bullitt	312	110	--------	202	41,025	43,528
Butler	248	241	--------	7	995,533	1,916,765
Caldwell	132	48	--------	84	768,983	3,680,004
Calloway	272	329	57	--------	1,563,200	4,288,000
Campbell	108	103	--------	5	214,295	220,018
Carroll	--------	--------	--------	--------	1,952,700	2,000,590
Carter	95	80	--------	15	41,284	25,559
Casey	304	244	--------	60	151,424	173,609
Christian	409	596	187	--------	2,860,750	12,042,620
Clark	1,272	754	--------	518	25,600	23,230
Clay	80	96	16	--------	29,329	21,469
Clinton	62	22	--------	40	238,650	549,040
Crittenden	782	790	8	--------	1,701,113	2,628,112
Cumberland	60	--------	--------	60	1,192,288	2.165,925
Daviess	502	550	48	--------	8,778,945	10,968,655
Edmonson	200	112	--------	88	498,190	935,606
Estill	53	83	30	--------	28,996	13,791
Elliott	258	58	--------	200	29,361	23,244
Fayette	849	301	--------	548	--------	--------
Fleming	534	30	--------	504	737,970	523,650
Floyd	152	67	--------	85	25,806	15,216
Franklin	1,152	101	--------	1,051	585,563	519,348
Fulton	39	57	18	--------	323,700	809,720
Gallatin	--------	--------	--------	--------	518,000	520,600
Garrard	1,564	949	--------	615	37,150	32,050
Grant	361	45	--------	316	1,034,300	877,550
Graves	411	206	--------	205	3,671,047	6,705,805
Grayson	214	156	--------	58	1,908,885	2.987,388
Green	175	219	44	--------	1,358,200	2,540,375
Greenup	146	270	124	--------	7,140	12,700
Hancock	86	148	62	--------	2,036,100	2,709,700
Hardin	326	135	--------	191	419,470	976,342
Harlan	2	--------	--------	2	9,971	6,081
Harrison	900	229	--------	671	1,052,310	577,050
Hart	186	156	--------	30	1,634,371	3,661,410
Henderson	655	374	--------	281	9,121,511	10,451,026
Henry	865	119	--------	746	1,928,222	1,858,050
Hickman	117	85	--------	32	775,760	1.447,524
Hopkins	167	61	--------	106	3,215,500	6,173,610
Jackson	36	45	9	--------	38,780	13,725
Jefferson	--------	58	58	--------	--------	--------
Jessamine	482	355	--------	127	7,450	7,600
Johnson	61	56	--------	5	32,965	9,316
Kenton	596	387	--------	209	1,633,800	1,164,950
Knox	189	39	--------	150	23,882	22,362
Larue	79	40	--------	39	647,700	1,116,650

No. 4—Continued.

Increase.	Decrease.	Pounds of hemp, 1877.	Pounds of hemp, 1878.	Increase.	Decrease.
762,590	----------	----------	----------	----------	----------
478,798	----------	----------	----------	----------	----------
12,205	----------	300	----------	----------	300
1,265,162	----------	----------	----------	----------	----------
1,138,526	----------	----------	----------	----------	----------
----------	13,986	----------	----------	----------	----------
----------	3,813	----------	----------	----------	----------
88,261	----------	----------	----------	----------	----------
----------	3,630	659,600	839,150	179,550	----------
6,336	----------	----------	----------	----------	----------
24,000	----------	181,200	125,200	----------	56,000
----------	1,451,600	----------	----------	----------	----------
----------	11,766	----------	----------	----------	----------
1,145,000	----------	----------	----------	----------	----------
2,503	----------	----------	150	150	----------
921,232	----------	----------	----------	----------	----------
2,911,021	----------	----------	----------	----------	----------
2,724,800	----------	----------	----------	----------	----------
5,723	----------	----------	19,900	19,900	----------
47,890	----------	2,643	----------	----------	2,643
----------	15,725	----------	----------	----------	----------
22,185	----------	170	----------	----------	170
9,181,870	----------	----------	----------	----------	----------
----------	2,370	335,900	485,700	149,800	----------
----------	7,860	----------	----------	----------	----------
310,390	----------	----------	----------	----------	----------
926,999	----------	20	----------	----------	20
973,637	----------	----------	----------	----------	----------
2,189,710	----------	----------	----------	----------	----------
437,416	----------	----------	----------	----------	----------
----------	15,205	----------	----------	----------	----------
----------	6,117	70	50	----------	20
----------	----------	3,130,900	3,112,200	----------	18,700
----------	214,320	30,880	1,500	----------	29,380
----------	10,590	----------	----------	----------	----------
----------	66,215	185,100	354,000	168,900	----------
486,020	----------	----------	----------	----------	----------
2,600	----------	----------	----------	----------	----------
----------	5,100	109,500	138,200	28,700	----------
----------	156,750	----------	----------	----------	----------
3.034,758	----------	----------	310	310	----------
1,078,503	----------	----------	----------	----------	----------
1,182,175	----------	----------	----------	----------	----------
5,560	----------	1,200	----------	----------	1,200
673,600	----------	----------	----------	----------	----------
556,872	----------	----------	56	56	----------
----------	3,890	----------	15	15	----------
----------	475,260	11,000	86,500	75,500	----------
2,027,039	----------	----------	----------	----------	----------
1,329,515	----------	----------	----------	----------	----------
----------	70,172	----------	----------	----------	----------
671,764	----------	----------	----------	----------	----------
2,958,110	----------	----------	----------	----------	----------
----------	25,055	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------
150	----------	2,363,200	3,185,900	822,700	----------
----------	23,649	----------	----------	----------	----------
----------	468,850	----------	----------	----------	----------
----------	1,520	----------	20	20	----------
468,950	----------	----------	----------	----------	----------

No. 4—Continued.

COUNTIES.	Value of sheep killed by dogs,'77	Value of sheep killed by dogs,'78.	Increase.	Decrease	Pounds of tobacco, 1877.	Pounds of tobacco, 1878.
Laurel	$293	$166		$127	57.610	47,335
Lawrence	167	146		21	42,393	24,886
Lee	30	80	$50		16,338	9,055
Letcher	47	43		4	16,827	6,871
Lewis	451	144		307	384,700	235,700
Lincoln	147	66		81	2,100	2,000
Livingston	624	345		279	1,377,081	1,993,289
Logan	526	271		255	1,970,480	6,983,595
Lyon	241	97		144	400,547	1,172,200
Madison	201	235	34		52,500	29,060
Magoffin	45	33		12	29,639	13,941
Marion					265,380	327,170
Marshall	211	115		96	956,159	2,259,850
Martin	24	5		19	10,733	5,988
Mason	619	66		553	3,816,350	2,841,900
McCracken	434	164		270	1,313,800	1,684,950
McLean	389	229		160	2,777,835	4,089,820
Meade	74	392	318		635,400	1,093,610
Menifee	35	26		9	29,656	3,476
Mercer	315	91		224	515	2,786
Metcalfe	124	184	60		999,167	1,696,111
Monroe	168	197	29		667,150	969,700
Montgomery	118			118		
Morgan	175	152		23	31,972	20,141
Muhlenburg	648	273		375	1,967,617	2,055,195
Nelson	426	483	57		12,840	80,015
Nicholas	378	472	94		793,750	459,150
Ohio	694	442		252	3,992,881	5,638,700
Oldham	984	292		692	134,700	130,300
Owen	1,406	233		1,173	4,012,970	2,898,200
Owsley	13	10		3	17,068	9,683
Pendleton	125	81		44	3,723,625	2,796,050
Perry	13	59	46		11,199	7,263
Pike	10	79	69		41,680	14,948
Powell	123	120		3	22,141	10,315
Pulaski	138	268	130		40,933	44,195
Robertson	115	74		41	1,372,495	975,950
Rockcastle	151	173	22		24,685	24.610
Rowan		56	56		20,110	9,897
Russell	222	83		139	165,840	238,802
Scott	661	465		196	134,250	58,700
Shelby	524	216		308	297,050	286,750
Simpson	280	157		123	785,116	2,502,401
Spencer	139	193	54		21,830	14,650
Taylor	255	117		138	1,298,680	1.868,265
Todd	42	364	322		2,799,700	5,936,240
Trigg	279	425	146		1,584,701	6,403,947
Trimble	737	252		485	1,229,650	1,439,600
Union	683	176		507	4,586,800	5,358,300
Warren	992	286		706	2,072,900	4,405,130
Washington		92	92		4,300	2,000
Wayne	40	49	9		43,340	44.355
Webster	12	61	49		3,439,320	4,838,302
Whitley	82	14		68	9,130	6,890
Wolfe	125	37		88	32,978	8,098
Woodford	58	238	180		13,000	
Total	$37,144	$22,602	$3,397	$17,939	120,967,479	181,484,630

No. 4—Continued.

Increase.	Decrease.	Pounds of hemp, 1877.	Pounds of hemp, 1878.	Increase.	Decrease.
----	10,275	----	----	----	----
----	17,507	----	----	----	----
----	7,283	----	----	----	----
----	9,956	----	----	----	----
----	149,000	----	----	----	----
----	100	500	----	----	500
616,208	----	----	----	----	----
5,013,115	----	----	----	----	----
771,653	----	----	----	----	----
----	23,440	5,000	32,800	27,800	----
----	15,698	----	----	----	----
61,790	----	----	----	----	----
1,303,691	----	----	----	----	----
----	4,745	----	----	----	----
----	974,450	152,500	139,800	----	12,700
371,150	----	----	----	----	----
1,311,985	----	----	----	----	----
458,210	----	----	----	----	----
----	26,180	----	----	----	----
2,271	----	28,000	50,500	22,500	----
696,944	----	----	----	----	----
302,550	----	----	----	----	----
----	----	----	----	----	----
----	11,831	----	----	----	----
87,578	----	----	----	----	----
67,175	----	----	----	----	----
----	334,600	----	----	----	----
1,645,819	----	----	----	----	----
----	4,400	----	----	----	----
----	1,114,770	----	1,200	1,200	----
----	7,385	----	----	----	----
----	927,575	----	----	----	----
----	3,936	----	----	----	----
----	26,732	----	----	----	----
----	11,826	----	----	----	----
3,262	----	----	----	----	----
----	396,545	----	----	----	----
----	75	110	----	----	110
----	10,213	----	----	----	----
72,962	----	----	----	----	----
----	75,550	1,967,500	2,055,400	87,900	----
----	10,300	323,200	463,600	140,400	----
1,717,285	----	----	4,500	4,500	----
----	7,180	----	----	----	----
569,585	----	----	----	----	----
3,136,540	----	----	----	----	----
4,819,246	----	----	----	----	----
209,950	----	----	----	----	----
771,500	----	----	----	----	----
2,332,230	----	100	----	----	100
----	2,300	----	----	----	----
1,015	----	----	----	----	----
1,398,982	----	----	----	----	----
----	2,240	----	----	----	----
----	24,880	----	587	587	----
----	13,000	1,960,000	2,445,600	485,600	----
67,794,566	7,277,415	11,448,593	13,542,838	2,216,088	121,843

No. 4—Continued.

COUNTIES.	Tons of hay, 1877.	Tons of hay, 1878.	Increase.	Decrease.	Bushels of corn, 1877.
Adair	1,908	1,747		161	579,586
Allen	1,415	1,341		74	636,959
Anderson	383	1,036	653		489,732
Ballard	1,539	1,328		211	583,019
Barren	1,403	928		475	618,870
Bath	1,030	1,398	368		807,655
Bell	232	222		10	167,093
Boone	6,405	6,698	293		852,443
Bourbon	3,794	4,468	674		668,594
Boyd	1,364	1,266		98	230,782
Boyle	2,341	2,255		86	442,305
Bracken	776	982	206		502,529
Breathitt	75	140	65		262,808
Breckinridge	2,373	2,372		1	878,520
Bullitt	4,089	3,900		189	535,053
Butler	917	884		33	531,879
Caldwell	1,239	560		679	477,872
Calloway	1,091	718		373	574,100
Campbell	3,300	3,863	563		256,345
Carroll	2,933	2,718		215	364,385
Carter	827	978	151		440,681
Casey	911	952	41		480,440
Christian	2,719	1,758		961	1,006,027
Clark	2,946	3,033	87		680,150
Clay	543	472		71	403,794
Clinton	923	374		549	279,020
Crittenden	1,167	962		205	714,981
Cumberland	624	171		453	390,930
Daviess	3,762	3,849	87		954,490
Edmonson	88	157	69		305,956
Estill	890	972	82		378,816
Elliott	221	299	78		263,592
Fayette	5,034	5,228	194		965,200
Fleming	2,020	2,451	431		865,805
Floyd	343	305		38	431,024
Franklin	1,695	2,275	580		645,382
Fulton	1,273	646		627	391,715
Gallatin	1,283	1,388	105		265,200
Garrard	1,218	1,389	171		789,525
Grant	1,362	2,080	718		865,181
Graves	2,155	1,191		964	910,822
Grayson	649	1,662	1,013		635,070
Green	594	596	2		372,035
Greenup	1,708	1,777	69		547,180
Hancock	3,025	2,069		956	327,020
Hardin	3,551	3,177		374	1,131,515
Harlan	352	416	64		205,579
Harrison	2,172	2,919	747		875,140
Hart	366	474	108		732,055
Henderson	4,130	3,540		590	1,191,746
Henry	2,715	2,759	44		693,545
Hickman	995	520		475	583,231
Hopkins	1,098	1,293	195		658,497
Jackson	269	364	95		200,405
Jefferson	6,869	5,805		1,064	886,782
Jessamine	2,254	1,955		299	479,704
Johnson	363	395	32		408,645
Kenton	3,500	3,770	270		420,705
Knox	653	702	49		381,833
Larue	913	974	61		528,218

No. 4—Continued.

Bushels of corn, 1878.	Increase.	Decrease.	Bushels of wheat, 1877.	Bushels of wheat, 1878.	Increase.	Decrease.
462,742	----------	116,844	43,847	61,943	18,096	--------
507,269	----------	129.690	51,649	67,296	15,647	--------
279,211	----------	210,521	21,060	33.434	12,374	--------
734,361	151,342	----------	91,854	150,700	58,846	--------
558,415	----------	60,455	62,465	80,669	18,204	--------
724,480	----------	83,175	30,471	53.610	23,139	--------
160,916	----------	6,177	2,201	1,954	----------	247
829,467	----------	22,976	12,556	31,271	18,715	--------
878,336	209,742	----------	82,530	157,324	74,794	--------
163,720	----------	67,062	8,587	20,139	11,552	--------
290,725	----------	151,580	48,272	74.875	26,603	--------
533,515	30,986	----------	46,868	85,134	38,266	--------
244,015	----------	18,793	1,704	2,696	992	--------
786,005	----------	92,515	50,690	84,445	33,755	--------
469,867	----------	65,186	16,038	37,686	21,648	--------
490,692	----------	41,187	25.851	33,780	7,929	--------
508,168	30,296	----------	32,523	39,751	7,228	--------
579,100	5,000	----------	54,875	71,835	16,960	--------
224,210	----------	32,135	24,203	36.718	12,515	--------
399,261	34,876	----------	10,477	20,610	10,133	--------
349,086	----------	91,595	1,773	4,706	2,933	--------
425,730	----------	54,710	21,276	23,594	2,318	--------
855,080	----------	150,947	283.900	377,870	93,970	--------
723,885	43,735	----------	42,573	64,375	21,802	--------
370,023	----------	33,771	8,897	8,309	----------	588
233,510	----------	45.510	29,859	34,473	4,614	--------
683,005	----------	31,976	42,709	46,284	3,575	--------
354,380	----------	36,550	28,744	40,431	11,687	--------
978,010	23,520	----------	67,245	92,016	24,771	--------
269,506	----------	36,450	20,411	20,787	376	--------
389,576	10,760	----------	10,381	12.607	2,226	--------
224,049	----------	39,543	2,907	5,995	3,088	--------
849,000	----------	116,200	81,090	174,155	93,065	--------
752,685	----------	113,120	73,143	119.773	46,630	--------
386,662	----------	44,362	7,021	11,507	4,486	--------
478,358	----------	167,024	32,810	52,228	19.418	--------
500,250	108,535	----------	51,412	98.039	46,627	--------
272,900	7,700	----------	3,500	9,950	6,450	--------
698,980	----------	90,545	66,390	89,610	23,220	--------
728,604	----------	136.577	17,652	35,241	17,589	--------
824,589	----------	86,233	105,447	177,129	71,682	--------
518,055	----------	117,015	32,105	46,370	14,265	--------
348,250	----------	23.785	27,191	50,582	23,391	--------
456,195	----------	90,985	20,526	44,262	23.736	--------
303,416	----------	23,604	8,269	19,812	11,543	--------
826,275	----------	305,240	130,382	218,162	87,780	--------
222,387	16,808	----------	1,426	1,983	557	--------
925,755	50,615	----------	82,526	148,441	65,915	--------
689,081	----------	42,974	73,914	96,353	22,439	--------
1,123,440	----------	68,306	60,918	93,014	32,096	--------
663,975	----------	29,570	15,136	35,949	20,813	--------
771,950	188,719	----------	59,868	124.749	64,881	--------
703,539	45,042	----------	56,380	79.426	23,046	--------
211,875	11,470	----------	5,445	6,705	1,260	--------
629,215	----------	257,567	45,846	69,269	23,423	--------
400,000	----------	79,704	71,085	124,050	52,965	--------
333,198	----------	75,447	6,560	11,550	4,990	--------
385,818	----------	34,887	8,554	14,720	6,166	--------
390,573	8,740	----------	14,663	17,176	2,513	--------
413,570	----------	114,648	56,668	86,386	29,718	--------

No. 4—Continued.

COUNTIES.	Tons of hay, 1877.	Tons of hay, 1878.	Increase	Decrease.	Bushels of corn, 1877.
Laurel	1,104	1,311	207	----------	265,600
Lawrence	746	937	191	----------	405,623
Lee	148	182	34	----------	143,465
Letcher	268	295	27	----------	98,964
Lewis	1,537	1,683	146	----------	559,160
Lincoln	2,116	3,546	1,430	----------	294,525
Livingston	2,013	1,459	----------	554	551,624
Logan	4,727	1,667	----------	3,060	1,121,984
Lyon	654	380	----------	274	288,290
Madison	1,630	1,469	----------	161	1,263,100
Magoffin	485	431	----------	54	258,357
Marion	2,540	2,306	----------	234	802,405
Marshall	1,103	647	----------	456	488,185
Martin	21	28	7	----------	91,802
Mason	2,185	3,160	975	----------	1,015,280
McCracken	997	600	----------	397	274,842
McLean	1,223	1,262	39	----------	382,325
Meade	516	937	421	----------	567,390
Menifee	162	150	----------	12	100,485
Mercer	1,978	2,773	795	----------	651,200
Metcalfe	1,167	938	----------	229	400,446
Monroe	1,620	1,184	----------	436	459,056
Montgomery	1,043	1,632	589	----------	371,975
Morgan	723	798	75	----------	376,311
Muhlenburg	1,444	1,453	9	----------	521,287
Nelson	3,230	3,587	357	----------	1,009,235
Nicholas	840	1,445	605	----------	673,950
Ohio	3,131	2,963	----------	168	815,350
Oldham	1,713	2,137	424	----------	480,900
Owen	1,000	1,321	321	----------	909,547
Owsley	267	396	129	----------	188,437
Pendleton	1,469	1,848	379	----------	833,655
Perry	13	20	7	----------	143,918
Pike	203	218	15	----------	506,140
Powell	202	209	7	----------	127,772
Pulaski	1,811	1,474	----------	337	642,580
Robertson	91	182	91	----------	304,085
Rockcastle	649	673	24	----------	297,805
Rowan	212	288	76	----------	145,018
Russell	542	380	----------	162	321,625
Scott	1,915	2,135	220	----------	947,510
Shelby	2,362	3,137	775	----------	1,173,805
Simpson	637	586	----------	51	611,972
Spencer	996	1,676	680	----------	624,616
Taylor	967	754	----------	213	338,718
Todd	1,219	925	----------	294	648,080
Trigg	1,713	916	----------	797	567,572
Trimble	1,299	1,219	----------	80	370,950
Union	3,304	2,989	----------	315	1,212,120
Warren	1,854	1,747	----------	107	1,365,215
Washington	111	337	226	----------	727,390
Wayne	1,516	549	----------	967	498,144
Webster	1,024	1,265	241	----------	479,470
Whitley	699	600	----------	99	385,520
Wolfe	581	601	20	----------	208,425
Woodford	3,168	516	----------	2,652	588,120
Total	177,675	173,242	17,907	22,340	64,049,490

No. 4—Continued.

Bushels of corn, 1878	Increase.	Decrease.	Bushels of wheat, 1877.	Bushels of wheat, 1878.	Increase.	Decrease.
260,625	---------	4,975	11,718	15,254	3,536	---------
419,476	13,853	---------	7,941	15,825	7,884	---------
130,300	---------	13,165	2,442	2,806	364	---------
162,624	63,660	---------	5,720	9,190	3,470	---------
495,600	---------	63,560	20,548	37,835	17,287	---------
489,320	194,795	---------	29,256	74,350	45,094	---------
639,247	87,623	---------	32,164	47,621	15,457	---------
896,600	---------	225,384	281,347	337,553	56,206	---------
304,434	16,144	---------	23,937	28,924	4,987	---------
1,122,940	---------	140,160	52,880	74,490	21,610	---------
213,445	---------	44,912	5,429	10,505	5,076	---------
576,660	---------	225,745	50,664	59,585	8,921	---------
474,372	---------	13,813	56,222	71,986	15,764	---------
83,374	---------	8,428	459	838	379	---------
904,560	---------	110,720	104,445	188,030	83,585	---------
318,385	43,543	---------	31,839	48,222	16,383	---------
402,005	19,680	---------	38,454	51,600	13,146	---------
529,446	---------	37,944	36,219	78,231	42,012	---------
96,459	---------	4,026	1,407	2,489	1,082	---------
493,215	---------	157,985	70,778	103,557	32,779	---------
342,019	---------	58,427	33,652	44,109	10,457	---------
398,485	---------	60,571	43,879	54,225	10,346	---------
411,700	39,725	---------	17,566	32,729	15,163	---------
288,497	---------	87,814	7,169	11,249	4,080	---------
470,716	---------	50,571	56,174	68,337	12,163	---------
759,960	---------	249,275	67,718	111,939	44,221	---------
617,490	---------	56,460	42,553	75,164	32,611	---------
794,789	---------	20,561	60,991	74,863	13,872	---------
301,145	---------	179,755	6,655	17,520	10,865	---------
799,690	---------	109,857	13,628	35,967	22,339	---------
175,910	---------	12,527	5,279	9,545	4,266	---------
684,125	---------	149,530	44,534	76,774	32,240	---------
85,121	---------	58,797	643	1,368	725	---------
402,657	---------	103,483	13,207	16,439	3,232	---------
142,060	14,288	---------	2,479	2,961	482	---------
563,926	---------	78,654	45,008	60,655	15,647	---------
268,510	---------	35,575	23,777	40,570	16,793	---------
285,267	---------	12,538	10,483	14,060	3,577	---------
141,400	---------	3,618	2,121	3,762	1,641	---------
288,062	---------	33,563	21,400	29,891	8,491	---------
878,696	---------	68,814	90,026	140,515	50,489	---------
973,290	---------	200,515	35,777	100,248	64,471	---------
515,286	---------	96,686	117,500	130,834	13,334	---------
479,255	---------	145,361	54,821	88,227	33,406	---------
242,945	---------	95,773	28,941	37,615	8,674	---------
617,600	---------	30,480	183,511	204,910	21,399	---------
571,474	3,902	---------	80,244	89,891	9,647	---------
342,795	---------	28,155	12,000	26,749	14,749	---------
1,343,495	131,375	---------	106,040	143,217	37,177	---------
1,147,990	---------	217,225	117,627	132,408	14,781	---------
458,760	---------	268,630	36,569	58,509	21,940	---------
441,897	---------	56,247	41,610	57,651	16,041	---------
615,164	135,694	---------	51,291	73,002	21,711	---------
388,180	2,660	---------	15,765	16,450	685	---------
174,704	---------	33,721	2,645	4,210	1,565	---------
393,650	---------	194,470	149,540	173,470	23,930	---------
58,308,707	1,744,828	7,485,611	5,002,015	7,452,832	2,451,652	835

No. 4—Continued.

COUNTIES.	Bushels of barley, 1877.	Bushels of barley, 1878.	Increase.	Decrease.	Tons of pig met'l. 1877.	Tons of pig met'l. 1878.	Increase.
Adair							
Allen							
Anderson		305	305				
Ballard		60	60				
Barren							
Bath							
Bell							
Boone	340	850	510				
Bourbon	4,415	14,035	9,620				
Boyd	200			200	10,400	71,637	61,237
Boyle	4,150	6,400	2,250				
Bracken	195			195			
Breathitt							
Breckinridge	302	487	185				
Bullitt	60			60			
Butler	15	2		13			
Caldwell		200	200				
Calloway							
Campbell	18,891	24,183	5,292				
Carroll	435	40		395			
Carter							
Casey							
Christian	3,362	100		3,262			
Clark	8,030	12,320	4,290				
Clay							
Clinton							
Crittenden	6			6			
Cumberland	10	80	70				
Daviess	275	163		112			
Edmonson							
Estill	1			1			
Elliott							
Fayette	75,780	115,171	39,391				
Fleming		600	600				
Floyd							
Franklin	6,658	15,922	9,264				
Fulton							
Gallatin	200			200			
Garrard		100	100				
Grant	500			500			
Graves							
Grayson							
Green							
Greenup	6,250	8,275	2,025		7,025	6,944	
Hancock							
Hardin	150	125		25			
Harlan							
Harrison	300	2,060	1,760				
Hart						40	40
Henderson	76	100	24				
Henry		655	655				
Hickman							
Hopkins		217	217				
Jackson							
Jefferson	1,445	7,000	5,555				
Jessamine	24,425	45,245	20,820				
Johnson							
Kenton	300	300					
Knox							
Larue							

No. 4—Continued.

Decrease.	Tons of bloom, 1877.	Tons of bloom, 1878.	Increase.	Decrease.	Tons of bar iron, 1877.	Tons of bar iron, 1878.	Inc.	Dec.
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--------	7,086	--------	--------	7,086	--------	--------	--------	--------
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No. 4—Continued.

COUNTIES.	Bushels of barley, 1877.	Bushels of barley, 1878.	Increase.	Decrease.	Tons of pig met'l, 1877.	Tons of pig met'l, 1877.	Increase.
Laurel							
Lawrence							
Lee							
Letcher							
Lewis							
Lincoln							
Livingston							
Logan							
Lyon							
Madison							
Magoffin							
Marion	40			40			
Marshall							
Martin							
Mason	16,160	19,070	2,910				
McCracken		580	580				
McLean							
Meade							
Menifee							
Mercer		500	500				
Metcalfe							
Monroe							
Montgomery		220	220				
Morgan							
Muhlenburg	349			349			
Nelson		1,475	1,475				
Nicholas							
Ohio							
Oldham							
Owen		50	50				
Owsley							
Pendleton	1,995	3,261	1,266				
Perry							
Pike							
Powell							
Pulaski							
Robertson							
Rockcastle							
Rowan							
Russell		5	5				
Scott	6,174	63,161	56,987				
Shelby	80	1,370	1,290				
Simpson	13	116	103				
Spencer							
Taylor							
Todd							
Trigg					1,875	1,900	25
Trimble	30			30			
Union							
Warren		155	155				
Washington							
Wayne							
Webster	75	65		10			
Whitley							
Wolfe							
Woodford	106,780	145,130	38,350				
Total	288,467	490,153	207,084	5,398	19,300	80,521	61,302

No. 4—Continued.

Decrease	Tons of bloom, 1877.	Tons of bloom, 1878.	Increase.	Decrease.	Tons of bar iron, 1877.	Tons of bar iron, 1878.	Inc.	Dec.
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81	12,242	------	------	12,242	------	------	------	------

NEGRO.—No. 4—Continued.

COUNTIES.	Acres of land, 1877.	Acres of land, 1878.	Increase.	Decrease.	Value of land, 1877.
Adair	6,580	7,075	495		$27,971
Allen	1,456	1,202		254	6,956
Anderson	254	253		1	3,695
Ballard	949	1,417	468		5,783
Barren	5,747	5,173		774	37,750
Bath	478	526	48		3,635
Bell	570	623	53		820
Boone	214	137		77	4,300
Bourbon	511	467		44	34,907
Boyd	5	8	3		500
Boyle	1,797	1,727		70	43,250
Bracken	938	768		170	12,655
Breathitt	2,640	2,975	335		2,335
Breckinridge	3,829	3,938	109		18,360
Bullitt	587	595	8		3,453
Butler	2,328	12,722	10,394		9,180
Caldwell	1,440	1,344		96	11,489
Calloway	1,724	1,776	52		8,035
Campbell	57	7		50	1,370
Carroll	370	326		44	6,190
Carter	155	88		67	1,290
Casey	1,382	1,534	152		3,317
Christian	6,187	6,969	782		38,185
Clark	891	976	85		10,910
Clay	2,928	3,032	104		7,875
Clinton	315	345	30		750
Crittenden	2,114	2,684	570		11,665
Cumberland	703	406		297	4,150
Daviess	3,292	3,863	571		34,751
Edmonson	1,977	1,896		81	15,989
Estill	580	485		95	1,835
Elliott	82	487	405		580
Fayette	999	731		268	40,010
Fleming	462	372		90	7,485
Floyd					
Franklin	2,225	1,877		348	37,507
Fulton	457	445		12	3,785
Gallatin	562	647	85		10,305
Garrard	1,176	1,958	782		15,895
Grant	141	37		104	1,485
Graves	2,747	2,848	101		19,841
Grayson	1,045	898		147	3,470
Green	2,941	4,134	1,193		17,845
Greenup	710	717	7		3,395
Hancock	512	692	180		5,200
Hardin	1,435	1,492	57		9,955
Harlan	350	450	100		550
Harrison	1,113	1,040		73	13,585
Hart	3,961	3,915		46	21,009
Henderson	4,310	3,234		1,076	30,927
Henry	295	362	67		4,305
Hickman	963	872		91	9,104
Hopkins	2,809	2,131		678	13,835
Jackson	980	275		705	2,325
Jefferson	1,224	1,274	50		37,680
Jessamine	872	1,001	129		13,080
Johnson					
Kenton	16	12		4	700
Knox	1,529	1,391		138	2,705
Larue	1,020	946		74	8,572

NEGRO.—No. 4—Continued.

Blacks that are blind, 1877.	Increase.	Decrease.	Blacks that are deaf and dumb, 1877.	Blacks that are deaf and dumb, 1878.	Increase.	Decrease.
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NEGRO.—No. 4—Continued.

COUNTIES.	Tavern licenses, 1877.	Tavern licenses, 1878.	Increase.	Decrease.	Blacks that are blind, 1877.
Laurel					
Lawrence					
Lee					
Letcher					
Lewis					
Lincoln					
Livingston					
Logan					
Lyon					
Madison					
Magoffin					
Marion					
Marshall					
Martin					
Mason					
McCracken					
McLean					
Meade					
Menifee					
Mercer					
Metcalfe					
Monroe					
Montgomery					1
Morgan					
Muhlenburg					
Nelson					
Nicholas					
Ohio					[illegible]
Oldham					
Owen					
Owsley					
Pendleton					
Perry					
Pike					
Powell					
Pulaski					
Robertson					
Rockcastle					
Rowan					
Russell					
Scott					
Shelby					
Simpson					
Spencer					
Taylor					
Todd					
Trigg					1
Trimble					
Union					
Warren					
Washington					
Wayne					
Webster					
Whitley					
Wolfe					
Woodford					
Total					3

NEGRO.—No. 4—Continued.

Blacks that are blind, 1878.	Increase.	Decrease.	Blacks that are deaf and dumb, 1877.	Blacks that are deaf and dumb, 1878.	Increase.	Decrease.
		1				
2	1		2			2
4	3	2	3	3	2	2

NEGRO.—No. 4—Continued.

COUNTIES.	No. of dogs over two, 1877.	No. of dogs over two, 1878.	Increase.	Decrease.	Number of sheep killed by dogs, 1877.
Adair					
Allen					
Anderson					
Ballard	2			2	
Barren	3			3	
Bath	17			17	
Bell					
Boone	3	1		2	
Bourbon					
Boyd	1			1	
Boyle					
Bracken	3			3	
Breathitt					
Breckinridge					
Bullitt		1	1		
Butler		1	1		3
Caldwell	2			2	
Calloway					
Campbell					
Carroll					
Carter					
Casey		2	2		
Christian	7	3		4	1
Clark	13			13	
Clay	1	2	1		1
Clinton					
Crittenden	3	5	2		
Cumberland					
Daviess		1	1		
Edmonson					
Estill					
Elliott					
Fayette	7			7	
Fleming					
Floyd					
Franklin	3			3	
Fulton		1	1		3
Gallatin					
Garrard		4	4		
Grant	2			2	
Graves	1			1	1
Grayson					
Green	1			1	
Greenup					
Hancock					
Hardin					
Harlan					
Harrison		4	4		
Hart					
Henderson	70	23		47	
Henry	4	4			
Hickman					
Hopkins					
Jackson					
Jefferson	22			22	
Jessamine	2			2	
Johnson					
Kenton	3	1		2	
Knox		1	1		
Larue					4

NEGRO.—No. 4—Continued.

Number of sheep killed by dogs, 1878.	Increase	Decrease.	Value of sheep killed by dogs, 1877	Value of sheep killed by dogs, 1878.	Increase.	Decrease.
2	2			$4	$4	
10	7		$6	20	14	
		1				
1			2	2		
1	1			2	2	
1	1			3	3	
1	1			3	3	
		3	10			$10
6	6			25	25	
		1	2			2
1	1			1	1	
14	14			35	35	
10	10					
1	1			2	2	
		4	9			9

NEGRO.—No. 4—Continued.

COUNTIES.	No. of dogs over two, 1877.	No. of dogs over two, 1878.	Increase.	Decrease.	Number of sheep killed by dogs, 1877.
Laurel		1	1		
Lawrence		2	2		
Lee					
Letcher					2
Lewis					
Lincoln					
Livingston	1	1			
Logan	2			2	
Lyon	1	2	1		
Madison					
Magoffin					
Marion	10			10	
Marshall		1	1		
Martin					
Mason	7			7	
McCracken	4			4	
McLean	9	6		3	
Meade					
Menifee					
Mercer	1	6	5		
Metcalfe		1	1		
Monroe					
Montgomery	15			15	3
Morgan		1	1		
Muhlenburg		2	2		15
Nelson	1	1			
Nicholas					
Ohio					1
Oldham					
Owen		4	4		
Owsley					
Pendleton	2	4	2		
Perry		1	1		
Pike	1			1	
Powell					
Pulaski	1			1	
Robertson					
Rockcastle					
Rowan					
Russell					2
Scott	6			6	
Shelby	7			7	
Simpson	1			1	1
Spencer					
Taylor		3	3		2
Todd	1	1			
Trigg		1	1		1
Trimble					
Union	24			24	
Warren	1			1	
Washington					
Wayne		1	1		
Webster					
Whitley	1			1	
Wolfe					2
Woodford	2			2	
Total	268	93	44	219	42

NEGRO.—No. 4—Continued.

Number of sheep killed by dogs, 1878.	Increase.	Decrease.	Value of sheep killed by dogs. 1877.	Value of sheep killed by dogs, 1878	Increase.	Decrease.
		2	$4			$4
2	2					
1	1			$2	$2	
3	3			6	6	
		3				
4		11	31	8		23
1			2	2		
1	1			2	2	
2	2			6	6	
		2	4			4
		1	2			2
		2	4			4
2	1		2	4	2	
		2	4			4
64	54	32	$82	$117	$107	$72

NEGRO.—No. 4—Continued.

COUNTIES.	Pounds of tobacco, 1877.	Pounds of tobacco, 1878.	Increase.	Decrease.	Pounds of hemp, 1877.
Adair	96,790	182,720	85,930	----	----
Allen	50,070	61,250	11,180	----	----
Anderson	----	----	----	----	----
Ballard	213,700	278,000	64,300	----	----
Barren	120,390	162,000	41,610	----	----
Bath	520	820	300	----	----
Bell	237	272	35	----	----
Boone	4,600	12,000	7,400	----	----
Bourbon	37,500	----	----	37,500	----
Boyd	92	----	----	92	----
Boyle	----	----	----	----	----
Bracken	83,500	26,800	----	56,700	----
Breathitt	235	95	----	140	----
Breckinridge	234,100	335,000	900	----	----
Bullitt	1,470	680	----	790	----
Butler	57,450	109,109	51,659	----	----
Caldwell	51,240	210,300	159,060	----	----
Calloway	58,100	202,000	143,900	----	----
Campbell	----	----	----	----	----
Carroll	74,800	70,100	----	4,700	----
Carter	335	840	505	----	----
Casey	1,540	2,030	490	----	----
Christian	131,925	716,000	584,075	----	----
Clark	----	----	----	----	----
Clay	1,122	572	----	550	----
Clinton	7,525	6,350	----	1,175	----
Crittenden	99,600	132,500	32,900	----	----
Cumberland	81,250	101,100	19,850	----	----
Daviess	566,800	565,660	----	1,140	----
Edmonson	16,500	113,860	97,360	----	----
Estill	95	215	120	----	----
Elliott	100	95	----	5	----
Fayette	----	----	----	----	----
Fleming	12,700	7,300	----	5,400	----
Floyd	248	30	----	218	----
Franklin	12,682	17,808	5,126	----	----
Fulton	9,250	34,700	25,450	----	----
Gallatin	29,600	----	----	29,600	----
Garrard	----	1,000	1,000	----	400
Grant	24,100	200	----	23,900	----
Graves	201,670	379,070	177,400	----	----
Grayson	21,050	19,700	----	1,350	----
Green	116,600	219,500	102,900	----	----
Greenup	----	----	----	----	----
Hancock	105,700	103,800	----	1,900	----
Hardin	7,400	10,400	3,000	----	----
Harlan	173	121	----	52	----
Harrison	14,500	16,000	1,500	----	----
Hart	170,528	317,705	147,177	----	----
Henderson	750,640	1,032,600	281,960	----	----
Henry	27,800	7,000	----	20,800	----
Hickman	78,340	128,770	50,430	----	----
Hopkins	210,300	454,100	243,800	----	----
Jackson	245	----	----	245	----
Jefferson	----	----	----	----	----
Jessamine	450	350	----	100	74,700
Johnson	----	----	----	----	----
Kenton	2,000	1,500	----	500	----
Knox	751	481	----	270	----
Larue	16,900	18,750	1,850	----	----

NEGRO.—No. 4—Continued.

Pounds of hemp, 1878.	Increase.	Decrease.	Tons of hay, 1877.	Tons of hay, 1878.	Increase.	Decrease.
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25	25	----------	----------	----------	----------	----------
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----------	----------	----------	8	10	7	----------
----------	----------	----------	4	12	8	----------
----------	----------	----------	3	7	4	----------
----------	----------	----------	7	11	4	----------
----------	----------	----------	2	----------	----------	2
----------	----------	----------	11	21	10	----------
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100	100	----------	16	12	----------	4
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15,500	15,100	----------	----------	8	8	----------
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120,200	45,500	----------	12	18	6	----------
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NEGRO.—No. 4—Continued.

COUNTIES	Pounds of tobacco, 1877.	Pounds of tobacco, 1878	Increase.	Decrease.	Pounds of hemp, 1877.
Laurel	305	320	15		
Lawrence	285	43		242	
Lee	265	30		235	
Letcher	881			881	
Lewis	1,600	2,000	400		
Lincoln					
Livingston	62,400	59,600		2,800	
Logan	104,930	308,500	203,570		
Lyon	45,985	161,333	115,348		
Madison	2,300			2,300	
Magoffin	180	10		170	
Marion	5,800	13,200	7,400		
Marshall	14,030	57,200	43,170		
Martin	25	30	5		
Mason	27,700	18,500		9,200	4,000
McCracken	93,850	127,900	34,050		
McLean	63,200	95,700	32,500		
Meade	18,500	51,050	32,550		
Menifee					
Mercer		100	100		
Metcalfe	47,249	72,645	25,396		
Monroe	32,750	39,700	6,950		
Montgomery					
Morgan	75	50		25	
Muhlenburg	110,435	236,000	125,565		
Nelson		4,500	4,500		
Nicholas	7,500	2,800		4,700	
Ohio	109,725	191,000	81,275		
Oldham	1,500	800		700	
Owen	95,400	84,300		11,100	
Owsley	15			15	
Pendleton	72,420	43,650		28,770	
Perry	145			145	
Pike	165	60		105	
Powell	590	845	255		
Pulaski	170	55		115	
Robertson	45,600	35,050		10,550	
Rockcastle	205	410	205		
Rowan		70	70		
Russell	17,550	24,200	6,650		
Scott	66,800	300		66,500	
Shelby					
Simpson	40,815	192,112	151,297		
Spencer					
Taylor	93,100	205,345	112,245		
Todd	187,500	318,300	130,800		
Trigg	78,350	367,350	289,000		
Trimble	12,200	19,900	7,700		
Union	303,400	273,300		30,100	
Warren	189,545	473,100	283,555		
Washington					
Wayne	50	130	80		
Webster	81,000	173,900	92,900		
Whitley					
Wolfe	62	50		12	
Woodford					27,500
Total	5,841,765	9,716,691	4,230,718	355,792	106,600

NEGRO.—No. 4—Continued.

Pounds of hemp, 1878	Increase.	Decrease.	Tons of hay, 1877.	Tons of hay, 1878.	Increase.	Decrease.
			1	2	1	
			2	2		
			1	4	3	
				2	2	
			3	3		
			10	4		6
			1	5	4	
				1	1	
			7			7
			1			1
1,000		3,000				
			11	1		10
			1			1
8,000	8,000		21	3		18
			1	1		
			24	3		21
			11	9		2
			4	10	6	
				4	4	
			18	15		3
			2	4	2	
				25	25	
			12	1		11
			5	3		2
				1	1	
				5	5	
			5	1		4
53,000	53,000		1	5	4	
1,100	1,100		1	1		
			3	10	7	
			6	7	1	
			2	5	3	
			6	1		5
			13	1		12
			16	1		15
				3	3	
			101	1		100
			1			1
			1			1
11,000		16,500	2			2
209,925	122,825	19,500	629	546	280	363

NEGRO.—No. 4—Continued.

COUNTIES.	Bushels of corn, 1877.	Bushels of corn, 1878.	Increase.	Decrease.	Bushels of wheat, 1877.
Adair	54,330	31,507		22,823	3,093
Allen	32,050	15,500		16,550	1,522
Anderson	4,380	3,800		580	127
Ballard	30,055	32,500	2,445		2,777
Barren	35,540	24,095		11,445	1,475
Bath	10,050	7,850		2,200	300
Bell	3,250	2,185		1,065	
Boone	4,150	9,400	5,250		
Bourbon	9,850	500		9,350	700
Boyd	990	330		660	33
Boyle	1,175			1,175	254
Bracken	8,225	5,370		2,855	230
Breathitt	2,420	3,650	1,230		3
Breckinridge	28,650	24,750		4,100	1,370
Bullitt	29,125	19,289		9,836	533
Butler	18,398	46,000	27,602		1,206
Caldwell	20,285	13,000		7,285	769
Calloway	20,300	18,740		1,560	1,400
Campbell		700	700		
Carroll	7,800	9,700	1,900		65
Carter	2,690	1,200		1,490	
Casey	10,645	9,664		981	194
Christian	44,705	36,095		8,610	9,250
Clark	7,735	9,820	2,085		550
Clay	9,163	9,598	435		23
Clinton	4,645	4,070		575	355
Crittenden	23,550	22,645		905	1,109
Cumberland	14,800	10,150		4,650	971
Daviess	35,159	27,485		7,674	2,489
Edmonson	16,000	12,690		3,310	701
Estill	3,350	4,800	1,450		50
Elliott	990	490		500	35
Fayette					
Fleming	5,450	1,380		4,070	315
Floyd	2,635	2,818	183		
Franklin	16,955	9,857		7,098	580
Fulton	14,050	23,650	9,600		868
Gallatin	5,700			5,700	100
Garrard	9,405	33,330	23,925		1,070
Grant	3,710	3,825	115		
Graves	34,603	37,135	2,532		3,044
Grayson	4,560	5,075	515		225
Green	25,665	21,540		4,125	2,045
Greenup	7,560	4,800		2,760	100
Hancock	8,690	8,200		490	420
Hardin	16,640	8,500		8,140	1,500
Harlan	1,950	2,355	405		
Harrison	18,830	18,020		810	1,050
Hart	50,521	41,106		9,415	5,100
Henderson	47,572	65,465	17,893		2,544
Henry	2,550	540		2,010	40
Hickman	31,698	38,905	7,207		1,548
Hopkins	33,600	48,930	15,330		2,669
Jackson	3,600	100		3,500	
Jefferson	11,440	3,700		7,740	1,780
Jessamine	10,618	15,030	4,412		1,605
Johnson	90	50		40	
Kenton		200	200		
Knox	13,030	11,315		1,715	407
Larue	6,100	6,840	740		280

NEGRO.—No. 4—Continued.

Bushels of wheat, 1878.	Increase.	Decrease.	Bushels of barley, 1877.	Bushels of barley, 1878.	Increase.	Decrease.
3,717	624					
1,059		463				
290	163					
3,578	801					
1,907	432		50			50
1,000	700					
30	30					
80	80					
115		585				
		33				
		254				
410	180					
25	22					
2,440	1,070					
664	131					
1,649	443					
435		334				
2,790	1,390					
70	70					
180	115					
254	60					
11,550	2,300					
540		10				
111	88					
245		110				
2,047	938					
737		234				
1,712		777				
834	133					
141	91					
44	9					
250		65				
25	25					
722	142					
2,037	1,169					
		100				
4,220	3,150					
90	90					
4,124	1,080					
320	95					
2,870	825					
550	450					
60		360				
650		850	50			50
3,490	2,440					
4,644		456				
6,418	3,874			75	75	
25		15				
3,602	2,054					
3,278	609					
1,000		780		400	400	
3,050	1,445			610	610	
488	*81*					
510	*230*					

NEGRO.—No. 4—Continued.

COUNTIES.	Bushels of corn, 1877.	Bushels of corn, 1878.	Increase.	Decrease.	Bushels of wheat, 1877.
Laurel	3,265	3,640	375		60
Lawrence	4,285	3,235		1,050	20
Lee	2,140	2,690	550		
Letcher	1,995	1,480		515	10
Lewis	1,470	1,100		370	140
Lincoln		1,000	1,000		
Livingston	14,115	17,835	3,720		596
Logan	53,985	35,100		18,885	4,027
Lyon	25,016	24,322		694	1,332
Madison	69,030	48,200		20,830	860
Magoffin	1,500	3,850	2,350		
Marion	17,545	10,740		6,805	455
Marshall	7,079	9,140	2,061		511
Martin	425	160		265	
Mason	4,500	7,350	2,850		200
McCracken	11,075	12,550	1,475		690
McLean	4,770	5,500	730		235
Meade	9,050	9,975	925		335
Menifee	150	75		75	
Mercer	13,530	10,080		3,450	1,161
Metcalfe	12,020	11,770		250	734
Monroe	10,395	11,085	690		1,080
Montgomery					
Morgan	2,035	980		1,055	10
Muhlenburg	28,445	24,208		4,237	2,692
Nelson	34,845	28,049		6,796	1,573
Nicholas	10,440	6,750		3,690	382
Ohio	20,270	21,115	845		1,544
Oldham	850	1,400	550		
Owen	14,656	15,300	644		91
Owsley	535	785	250		
Pendleton	11,695	9,300		2,395	495
Perry	1,105	690		415	
Pike	4,425	2,260		2,165	
Powell	4,734	6,950	2,216		52
Pulaski	9,495	6,945		2,550	576
Robertson	8,290	5,890		2,400	320
Rockcastle	7,100	5,600		1,500	160
Rowan	1,200	1,075		125	
Russell	10,385	11,135	750		424
Scott	28,655	17,325		11,330	2,091
Shelby					
Simpson	24,980	20,510		4,470	2,443
Spencer	8,785	7,710		1,075	421
Taylor	22,625	16,732		5,893	1,414
Todd	23,095	17,025		6,070	3,145
Trigg	28,332	27,675		657	2,329
Trimble	2,000	5,600	3,600		
Union	50,465	42,700		7,765	1,599
Warren	96,115	97,980	1,865		4,417
Washington	9,500	2,250		7,250	580
Wayne	5,270	7,080	1,810		243
Webster	8,810	15,730	6,920		660
Whitley	4,170	3,440		730	40
Wolfe	625	700	75		8
Woodford	6,000	2,200		3,800	1,000
Total	1,638,949	1,494,205	162,405	307,149	100,029

NEGRO.—No. 4—Continued.

Bushels of wheat, 1878.	Increase.	Decrease.	Bushels of barley, 1877.	Bushels of barley, 1878.	Increase.	Decrease.
55		5				
		20				
34	24					
150	10					
50	50					
912	316					
6,[illegible]91	2,364					
1,624	292					
1,450	590					
90	90					
1,019	564					
945	434					
620	420					
570		120				
230		5				
1,576	1,241					
2,498	1,337					
1,094	360					
1,430	350					
16	6					
2,888	196					
2,920	1,347					
830	448					
2,043	499					
250	250					
690	599					
805	310					
120	120					
95	43					
903	327					
680	360					
230	70					
77	77					
758	334					
3,810	1,719		500			500
3,590	1,147					
810	390					
1,791	377					
9,495	6,350					
2,014		315				
1,670	71					
4,645	228					
250		330				
427	184					
2,810	2,150					
60	20					
10	2					
300		700		400	400	
146,802	53,694	6,921	600	1,485	1,485	600

NEGRO.—No. 4—Continued.

COUNTIES.	Tons of pig metal, 1877.	Tons of pig metal, 1878.	Increase.	Decrease.	Tons of bloom, 1877.
Adair					
Allen					
Anderson					
Ballard					
Barren					
Bath					
Bell					
Boone					
Bourbon					
Boyd					
Boyle					
Bracken					
Breathitt					
Breckinridge					
Bullitt					
Butler					
Caldwell					
Calloway					
Campbell					
Carroll					
Carter					
Casey					
Christian					
Clark					
Clay					
Clinton					
Crittenden					
Cumberland					
Daviess					
Edmonson					
Estill					
Elliott					
Fayette					
Fleming					
Floyd					
Franklin					
Fulton					
Gallatin					
Garrard					
Grant					
Graves					
Grayson					
Green					
Greenup					
Hancock					
Hardin					
Harlan					
Harrison					
Hart					
Henderson					
Henry					
Hickman					
Hopkins					
Jackson					
Jefferson					
Jessamine					
Johnson					
Kenton					
Knox					
Larue					

NEGRO.—No. 4—Continued.

Tons of bloom, 1878.	Increase.	Decrease.	Tons of bar iron, 1877.	Tons of bar iron, 1878.	Increase.	Decrease.
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28,501	28,501	--------	--------	826	826	--------